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Effect of Nutrient Element and Leaf Cutting Year on Tea Quality At Unit Perkebunan (UP) Tambi Wonosobo

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Nutrients, Year Cut, Quality of Tea Leaves

ABSTRACT
This research was conducted on the tea plant which has the scientific name Camelia Sinesis L at the Tambi Plantation Unit (UP) located in Tambi Village, Kejajar District, Wonosobo Regency. The purpose of this study was to determine the effect of soil nutrients and the year of cut on the quality of tea leaves at UP Tambi. The flow of thought in this research, that after taking soil samples and leaf samples at the Tambi Wonosobo Tea Plantation Unit with the 4th cutting year (2018) and the 2nd cutting year (2021) then proceed with laboratory testing to determine nutrient content soil and substance content of tea leaves to measure the quality of tea plants. The sample for this study was taken using the instant sample method (Grab Sample), where the samples were taken directly from the soil body at a predetermined location with a depth of 20 cm from the soil surface, while the leaf sampling also used the Grab Sample method. The results of this study showed that the Correlation Test found that the content of Polyphenols, Catechins (EGCG), Flavonoids, and Caffein was influenced by soil nutrients pH, C org, N, available P2O5, P2O5, K2O, CaO, Ca, and Mg, meaning that there the effect of soil nutrients on the quality of tea leaves in the Tambi Plantation Unit (UP), Furthermore, there was no effect of the year of cutting on the quality of the tea leaves as shown by the results that in the 4th cutting year (2018) and the 1st cutting year (year 2021).

Introduction

A tea plant that has the scientific name *Camelia Sinesis L.* is one of the plants that has a lot of economic value and is widely cultivated in Indonesia because tea is a source of antioxidation and the body if consumed regularly (Pamungkas and Sumassageno, 2017). The types that grow in Indonesia are very diverse including Black Tea, Green Tea, White Tea, Red Tea, and so on. Tea plants in Indonesia can thrive by meeting the requirements for climate growth that has rainfall of more than 2,000 mm per year, bright sunlight, air temperatures between 13 – 25o Celsius, suitability for land use, and so on (West Java Plantation Office, 2018). One of the tea plantations in Indonesia is the Tambi Plantation Unit (UP) located in Tambi Village, Kejajar District, Wonosobo Regency.

Tea plants that grow in Tambi Wonosobo plantations are quality plants because in addition to air humidity, air temperature, sunlight, and rainfall, but also supported by nutrients contained in the plantation soil. Nutrients are mineral content in the soil that helps plants to grow better and produce quality plant products. Nutrients in the soil must be met considering the availability of natural nutrients is very limited and begins to decrease along with plant growth. Nutrients in plants themselves are divided into two categories, namely Macro Nutrients needed by plants in large quantities and Micro Nutrients which are only slightly needed by varied plants (Tongsiri, Tseng, Shen, & Lai, 2020). Nutrients that can be contained in the soil include Nitrogen, Phosphorus, Potassium, Magnesium, Chlorine, Iron, and others (Pontianak Food, Agriculture, and Fisheries Office, 2013). When soil nutrients are fulfilled properly, it will produce quality tea plants with the right aroma, taste, texture and other levels of content, besides being free from pests and diseases, so that the content of natural polyphenols in tea plants which are natural antioxidants can be felt benefits, because the quality of tea plants one of them depends on the amount of polyphenols they contain (ITB, 2021).

Tea plants have good quality, one of which has aroma, taste, texture and other levels of content, whose criteria have been adjusted to the Indonesian National Standard (SNI) 1902: 2016 both in general and specifically, including: (1) Has a dry leaf color of black, brown, to red; (2) Leaves are round, curly, rolled, and twisted; (3) Dense to brittle texture; (5) No foreign matter was found in the leaves; (6) The color of steeping water is reddish yellow to brownish red; (7) The taste and aroma of tea are very distinctive; (8) Steeping pulp is copper red to black with a characteristic aroma of tea; (9) Polyphenol content > 13%, and others (BSN, 2016). The quality of tea will certainly be disturbed if the leaves are not free from pests and diseases such as: tea leaf sucking ladybugs, leaf-rolling caterpillars, shoot rolling caterpillars, *Empoasca sp.*, root disease, late blight, and tip death disease (Center for Plantation Research and Development, 2010).

Quality tea plants that are free from pests and diseases, as well as sufficient nutrient content will have an impact on the age *of defoliation* (cutting year). *Defoliation* is the cutting process that humans carry out on the shoots of tea leaves that are ready to harvest. The cutting interval or age will affect plant regrowth, the amount of production and the quality of the next tea leaves, so setting the cutting interval is very important for Tambi tea plantations. Research conducted by Kurniawan et al, (2017) explained that the right fertilizer application will affect the number of plant saplings, plant height, and the amount of crop production or plant wet weight. However, the higher the level of fertilizer will reduce production yields because the very high content of Phosphorus (P) can inhibit the absorption of other nutrients, especially micronutrients (Ramadhani, Hazra, & Widyati, n.d.). Excessive Phosphorus (P) will show symptoms of Nitrogen (N) deficiency, resulting in a decrease in plant growing quality and leaf color quality. Therefore, through this study, an analysis will be carried out on the nutrients and cutting year and their effect on the quality of Tambi Wonosobo tea leaves (Tang et al., 2020).

The description in the background will be continued with the preparation of the formulation of the problem that will later be solved in this study is: How do soil nutrients affect the quality of Tambi Wonosobo tea leaves? How does the cutting year affect the quality of Tambi Wonosobo tea leaves?

Furthermore, the research objectives to be achieved by researchers in this study are: Knowing the influence of soil nutrients on the quality of Tambi Wonosobo tea leaves. Knowing the effect of cut year on the nutrients and quality of Tambi Wonosobo tea leaves.

Research on nutrients in the soil, cutting year, and quality of tea leaves will provide benefits of knowledge about tea growth so that it can be used as a reference to improve tea quality in Tambi Wonosobo Tea Plantation. Furthermore, the theories used in this study can be used as a reference for further research related to nutrients, cut year, tea plant quality.

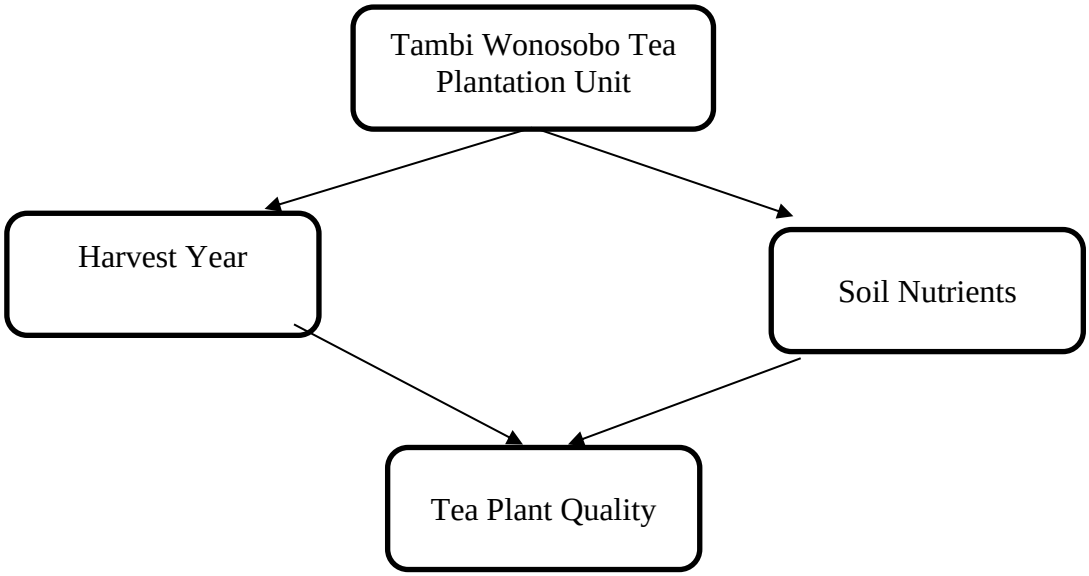

Figure 1 Research Framework

The framework explains how the train of thought in this study, where after taking soil samples and leaf samples at the Tambi Wonosobo Tea Plantation Unit with the 4th cut year (2018) and 2nd cut year (2021), it was continued with laboratory testing to determine the soil nutrient content and tea leaf substance content to measure the quality of tea plants.

In order to answer the formulation of the problem so that the research objectives are achieved, it is necessary to form hypotheses as temporary conjectures that will be proven.

H0: There is no relationship between the influence of nutrients in the soil and the quality of tea plants in Tambi Wonosobo Tea Plantation.

H1: There is a relationship between the influence of nutrients in the soil and the quality of tea plants in Tambi Wonosobo Tea Plantation.

Research Methods

Research on tea plants to test the nutrient content of the soil and the quality of tea plants was carried out from December 2021 to January 2022 at Tambi Wonosobo Tea Plantation located at the foot of Mount Sindoro, Jalan Tambi, Tlogomulyo Village, Wonosobo Regency, Kertek District, Central Java which is located at an altitude of 1,200-2,100 meters above sea level (masl) is a tea plant plantation unit. The Tambi Plantation Unit is divided into four garden blocks, namely the Park block, Panama block, Scenery block and Green Land block. The Park Block is located in Tambi Village, Kejajar District, Wonosobo Regency with an altitude of 1,300-1,500 meters above sea level. The View Block is located in Sigedang Village, Kejajar District, Wonosobo Regency with an altitude of 1,500-2,100 m above sea level and this block is the highest block in UP Tambi. Panama Block is located in Tlogo Village, Garung District, Wonosobo Regency with an

altitude of 1,250-1,500 meters above sea level. The location of the Green Land Block is in Jengkol Village, Garung District, Wonosobo Regency with an altitude of 1,000-1,250 meters above sea level.

The Tambi Plantation Unit (UP) has climate type C according to Schmit-Ferguson. UP Tambi air temperature ranges from 17°-23° C with air humidity ranging from 80%-95%. The altitude of the place in the Tambi Plantation Unit ranges from 1,000-2,100 meters above sea level. The soil type in UP Tambi is mostly Andosol with a pH of 4.5-5.0. The soil texture of UP Tambi is dusty loam to loam, with a loose consistency soil structure. The drainage condition in the UP Tambi field is moderate to fast. The topography of the land in general is choppy to hilly with a slope level of 0-45%.

Research that aims to determine the effect of nutrients in the soil on the quality of tea plants is a type of experimental quantitative research because this study uses measurement data in the form of numbers obtained from various series of experiments on nutrient content in the soil which results in differences in the amount of tea production and quality in Tambi Wonosobo Tea Plantation (Latipun, 2008).

Soil sampling is an important stage in this study because soil is a plant growing medium, so sampling is only done enough to describe how the physical condition of the soil based on its nutrient content can affect the quality of tea plants in Tambi Wonosobo Tea Plantation. In soil sampling using the instantaneous sample method (Grab Sample), where samples are taken directly from the soil body at a predetermined location with a depth of 20 cm from the soil surface, while leaf sampling also uses the instantaneous sample method (Grab Sample), where samples are taken directly from leaves in plant clumps around a predetermined location.

Results and Discussion

1. Land Condition of Tambi Plantation Unit Wonosobo Regency

Tambi Plantation Unit (UP) is located in Tambi Village, Kejajar District, Wonosobo Regency. UP Tambi, which is located at an altitude of 1,200-2,100 meters above sea level (masl), is a tea plantation unit. The Tambi Plantation Unit is divided into four garden blocks, namely the Park block, Panama block, Scenery block and Green Land block. The Park Block is located in Tambi Village, Kejajar District, Wonosobo Regency with an altitude of 1,300-1,500 meters above sea level. The View Block is located in Sigedang Village, Kejajar District, Wonosobo Regency with an altitude of 1,500-2,100 m above sea level and this block is the highest block in UP Tambi. Panama Block is located in Tlogo Village, Garung District, Wonosobo Regency with an altitude of 1,250-1,500 meters above sea level. The location of the Green Land Block is in Jengkol Village, Garung District, Wonosobo Regency with an altitude of 1,000-1,250 meters above sea level (Suryono & Kusuma, n.d.).

The Tambi Plantation Unit (UP) has climate type C according to Schmit-Ferguson. UP Tambi air temperature ranges from 17°-23° C with air humidity ranging from 80%-95%. The soil type in UP Tambi is mostly Andosol with a pH of 4.5-5.0. The soil texture of UP Tambi is dusty loam to loam, with a loose consistency soil structure. The drainage condition in the UP Tambi field is moderate to fast. Rainfall over the past 10 years (2011-2021) ranged from 2,385-4,717 mm with an average of 3,064.5 mm year-1 and rainy days between 133-238 with an average of 166.8 rainy days year-1. The average wet month over the past ten years (2011-2021) reached 8.1 and the dry month reached 2.9. Tambi Plantation Unit has climate type C according to Schmit-Ferguson (Dewi Anjarsari, Hamdani, Suherman, Nurmala, & Syahrian, 2020).

The total area of Tambi Plantation Unit (UP) is 273.17 ha. The area of TM is 226.99 ha and TBM is 18 ha. The rest of the land area is used for nurseries, factories, agrotourism, *emplacement*, major roads, grooves or ravines and fields. The types of tea plants cultivated at UP Tambi are TRI clones 2024, TRI 2025, Gambung 3, Gambung 4, Gambung 7, and Seedling (Hybrid and Acid). The average wet shoot production in UP Tambi over the last five years (2017-2021) is 3,587,468kg and dry production in UP Tambi is 776,893kg, so that wet productivity in UP Tambi is 14,426kg ha-1 year-1 and dry tea productivity in UP Tambi is 3,124kg ha-1 year-1. Kurniawati (2010) explained that the average wet productivity in UP Bedakah was 10,724 kg ha-1 year-1 and dry productivity was 2,349 kg ha-1 year-1. This shows that the average tea productivity in UP Tambi is higher than the tea productivity in UP Bedakah.

2. Soil Nutrient Content of Tambi Plantation Unit Wonosobo Regency

Tea plants that grow in Tambi Wonosobo plantations are quality plants because in addition to air humidity, air temperature, sunlight, and rainfall, but also supported by nutrients contained in the plantation soil. Nutrients are mineral content in the soil that helps plants to grow better and produce quality plant products. Nutrients in the soil must be met considering the availability of natural nutrients is very limited and begins to decrease along with plant growth. Nutrients in plants themselves are divided into two categories, namely Macro Nutrients needed by plants in large quantities and Micro Nutrients which are only slightly needed by varied plants. Nutrients that can be contained in the soil include Nitrogen, Phosphorus, Potassium, Magnesium, Chlorine, Iron, and others (Pontianak Food, Agriculture, and Fisheries Office, 2013). The following are the nutrients contained in UP Tambi, Wonosobo Regency, namely:

Table 7 Nutrient Content of UP Tambi Wonosobo Regency

Block	pH	C org (%)	N (%)	C/N (%)	P2O5 (mg/100g)	K20 (mg/100g)	CaO (mg/100g)
Views 2018 (harvest year ke-4)	4,89	5,73	0,74	7,74	0,0378	0,0189	0,3229
Views 2021 (harvest year ke-1)	4,98	4,88	0,48	10	128,53	25,47	15,36
Panama 2018 (harvest year ke-4)	5,05	5,12	0,69	7,42	0,0322	0,0314	0,2749
Panama 2021 (harvest year ke-1)	5,61	5,24	0,48	10	102,64	21,34	22,97

Block	MgO (mg/100g)	P2O5 (ppm)	Ca (me/100g)	Mg (me/100g)	K (me/100g)	KTK (me/100g)
Views 2018 (harvest year ke-4)	0,1001	132,76	1,2524	0,1808	0,4255	23,57
Views 2021 (harvest year ke-1)	5,58	11,98	0,57	0,09	0,24	18,51
Panama 2018 (harvest year ke-4)	0,0862	123,9	0,6702	0,1057	0,8624	25,07

Panama (harvest year ke-1)	2021	5,49	7,13	0,54	0,1	0,33	14,14

Source: Laboratory Test

These results show that in the 4th cut year (2018) and the 1st cut year (2021) there was no significant enough difference in the nutrient content of pH, C org, N, Ca, Mg, and K both in landscape land and Panama land. Very significant differences are only found in the soil content of P2O5, K2O, CaO, MgO, P2O5 available, and CEC. This shows that the application of fertilizer to the Tambi Plantation Unit (UP) land is appropriate so that it does not affect the soil nutrient content in the Tambi Plantation Unit (UP) even though several cuts have been made (Fauziah, Wulansari, & Rezamela, 2018). Therefore, the number of plant saplings, plant height, and the amount of crop production or wet weight of plants are not affected, and have no impact on the quality of plant growth and the color quality of tea leaves in the Tambi Plantation Unit (UP).

Table 8 Comparison of Nutrient Content with Tea Land Suitability Standards of the West Java Plantation Office

No	Nutrients	Laboratory Results	Tea Land Suitability Standard	Conclusion
1	pH	4,89 – 5,61	< 20	Has met the standards
2	KTK	14,14 – 25,07	>16 (me/100gr)	The Panamanian land in 2021 has the quality of CEC elements below standard, while other land has met the standards
3	C-Org	4,88 – 5,73	> 1,5%	Has met the standards

Source: Laboratory Test

If it is related to the Tea Land Suitability Standard of the West Java Plantation Office (2018), it is obtained that the soil pH of the scenery and Panama land has met the pH < standard of 20. Furthermore, the number of CECs on the 2018 Scenery, 2021 Scenery, and Panama 2018 lands has met the > 16 standard (me / 100 gr) meaning that the soil in the Plantation Unit (UP) has excellent CEC element quality, but in Panama 2021 land has a CEC element quality below standard, meaning there is a decrease in CEC nutrients. Then the C-org content in the scenery and Panama land has also exceeded the > standard of 1.5%, meaning that the quality of C-org elements in the Tambi Plantation Unit (UP) is very good.

3. Tea Leaf Content of Tambi Plantation Unit Wonosobo Regency

Tea plants have good quality, one of which has aroma, taste, texture and other levels of content, whose criteria have been adjusted to the Indonesian National Standard (SNI) 1902: 2016 both in general and specifically, including: (1) Has a dry leaf color of black, brown, to red; (2) Leaves are round, curly, rolled, and twisted; (3) Dense to brittle texture; (5) No foreign matter was found in the leaves; (6) The color of steeping water is reddish yellow to brownish red; (7) The taste and aroma of tea are very distinctive; (8)

Steeping pulp is copper red to black with a characteristic aroma of tea; (9) Polyphenol content > 13%, and others (BSN, 2016). The quality of tea will certainly be disturbed if the leaves are not free from pests and diseases such as: tea leaf sucking ladybugs, leaf-rolling caterpillars, shoot rolling caterpillars, *Empoasca sp.*, root disease, late blight, and tip death disease (Center for Plantation Research and Development, 2010). The following are the laboratory test results of tea leaf content found in UP Tambi, Wonosobo Regency, among others::

Table 9 Tea Leaf Content of UP Tambi Wonosobo Regency

Block	Chlorophyll A	Chlorophyll B	N Chain	P Chain	K Chain
Views 2018 (harvest year ke-4)	0,58	0,25	14,03	0,01	0,62
Views 2021 (harvest year ke-1)	0,46	0,16	16,19	0,01	0,45
Panama 2018 (harvest year ke-4)	0,38	0,14	32,83	0,01	0,72
Panama 2021 (harvest year ke-1)	0,62	0,37	17,95	0,01	0,49

Block	Total Polyphenols Content	Catechins (EGCG)	Total Flavonoid Content	Caffeine
Views 2018 (harvest year ke-4)	4,88	1,41	3,88	1,15
Views 2021 (harvest year ke-1)	5,46	0,76	5,11	1,33
Panama 2018 (harvest year ke-4)	4,97	0,72	4,03	1,4360
Panama 2021 (harvest year ke-1)	4,56	1,25	4,09	1,0390

Source: Laboratory Test

The table shows that in the 4th cut year (2018) and the 2nd cut year (2021) there was not a significant difference in the tea leaf content of Chlorophyll A, Chlorophyll B, N Tissue, P Tissue, K Tissue, Polyphenols, Cathecins (EGCG), Flavonoids, and Caffein in both Landscape and Panama land. The difference that is not too significant in the content of tea leaves shows that there is no influence of the 4th cut year or the 2nd cut year on the quality of tea plants in the Tambi Plantation Unit (UP).

Table 10 Comparison of Tea Content with Tea Plant Quality Standards (SNI 1902:2016)

No	Tea Content	Laboratory Results	Tea Plant Quality Standards	Conclusion
1	Total Polyphenols	4,89 – 5,61	< 20	Full standards
2	Klorofil A	0,38 – 0,62	1,39 – 5,39	Substandard
3	Klorofil B	0,14 – 0,37	0,77 – 2,06	Substandard
4	Cathecins (EGCG)	0,72 – 1,25	35 - 45	Substandard
5	Total Flavonoid	3,88 – 4,03	10 - 25	Substandard
6	Caffein	1,03 – 1,43	1.000	Substandard

Source: Laboratory Test

When compared with the Tea Plant Quality Standard (SNI 1902: 2016), it was found that the Polyphenol content in tea leaves in the Tambi Plantation Unit (UP) still did not meet the > 13 standard, meaning that the content was good but not good enough when compared to SNI standards, while the content of Chlorophyll A, Chlorophyll B, Cathecins (EGCG), Total Flavonoids, and Caffein was still below the standard.

4. The Effect of Soil Nutrient Content on Tea Leaf Quality

After laboratory testing on soil nutrient content, it was found that the soil in the Tambi Plantation Unit (UP) contained pH, C org, N, Ca, Mg, K, P2O5, K2O, CaO, MgO, P2O5 available, and CEC both on landscape land and Panama land. Furthermore, the tea leaves obtained the content of Chlorophyll A, Chlorophyll B, N Tissue, P Tissue, K Tissue, Polyphenols, Catechins (EGCG), Flavonoids, and Caffein, then conducted correlation testing (*Correlation Test*) with SPSS statistical tools and obtained the results that:

Table 11 Correlation Test Results

	pH	Chlorophyll_A	Chlorophyll_B	N_Network	K_Network	Total_Polyphenols	Catechins_EGCG	Total_Flavonoid	Caffein
pH	1	0.321	0.232	-0.361*	-0.191	-0.160	0.153	0.021	-.493**
Klorofil_A	0.321	1	0.896**	-0.661**	-0.126	-0.656**	0.892**	-0.487**	-.684**
Klorofil_B	0.232	0.896**	1	-0.340	-0.138	-0.747**	0.758**	-0.505**	-.517**
N_Jaringan	-0.361*	-0.661**	-0.340	1	0.478**	-0.077	-0.455**	-0.133	0.567**
K_Jaringan	-0.191	-0.126	-0.138	0.478**	1	-0.421*	0.200	-0.780**	-0.090
Total_Polyphenols	-0.160	-0.656**	-0.747**	-0.077	-0.421*	1	-0.752**	0.814**	0.502**

Catechins_EGCG	0.153	0.892**	0.758**	-0.455**	0.200	-0.752**	1	-0.694**	-.490**
Total_Flavonoid	0.021	-0.487**	-0.505**	-0.133	-0.780**	0.814**	-0.694**	1	0.413*
Caffein	-0.493**	-0.684**	-0.517**	0.567**	-0.090	0.502**	-0.490**	0.413*	1

	c_org	Klorofil_A	Klorofil_B	N_Jaringan	K_Jaringan	Total_Polyphenols	Catechins_EGCG	Total_Flavonoid	Caffein
c_org	1	.270	.098	-.323	.047	.002	.412*	-.163	.077
Klorofil_A	.270	1	.896**	-.661**	-.126	-.656**	.892**	-.487**	-.684**
Klorofil_B	.098	.896**	1	-.340	-.138	-.747**	.758**	-.505**	-.517**
N_Jaringan	-.323	-.661**	-.340	1	.478**	-.077	-.455**	-.133	.567**
K_Jaringan	.047	-.126	-.138	.478**	1	-.421*	.200	-.780**	-.090
Total_Polyphenols	.002	-.656**	-.747**	-.077	-.421*	1	-.752**	.814**	.502**
Catechins_EGCG	.412*	.892**	.758**	-.455**	.200	-.752**	1	-.694**	-.490**
Total_Flavonoid	-.163	-.487**	-.505**	-.133	-.780**	.814**	-.694**	1	.413*
Caffein	.077	-.684**	-.517**	.567**	-.090	.502**	-.490**	.413*	1

	N	Klorofil_A	Klorofil_B	N_Jaringan	K_Jaringan	Total_Polyphenols	Catechins_EGCG	Total_Flavonoid	Caffein
N	1	-.066	-.074	.249	.483**	-.041	.291	-.415*	.515**
Klorofil_A	-.066	1	.896**	-.661**	-.126	-.656**	.892**	-.487**	-.684**
Klorofil_B	-.074	.896**	1	-.340	-.138	-.747**	.758**	-.505**	-.517**
N_Jaringan	.249	-.661**	-.340	1	.478**	-.077	-.455**	-.133	.567**
K_Jaringan	.483**	-.126	-.138	.478**	1	-.421*	.200	-.780**	-.090
Total_Polyphenols	-.041	-.656**	-.747**	-.077	-.421*	1	-.752**	.814**	.502**
Catechins_EGCG	.291	.892**	.758**	-.455**	.200	-.752**	1	-.694**	-.490**
Total_Flavonoid	-415*	-.487**	-.505**	-.133	-.780**	.814**	-.694**	1	.413*
Caffein	.515**	-.684**	-.517**	.567**	-.090	.502**	-.490**	.413*	1

Source: SPSS Data Processing Results (Results are only partially displayed, the rest are recorded in the Appendix)

The table shows that there is a correlation between several nutrient contents (pH, C-org, N, P2O5, K2O, CaO, MgO, Ca, Mg, K, and CEC) with some tea leaf content (N Tissue, K Tissue, Total Polyphenols, Total Flavonoids, and Caffein).

The results of the Correlation Test *found that the content of Polyphenols, Catechins (EGCG), Flavonoids, and Caffein is influenced by soil nutrients pH, C org, N, P2O5 available, P2O5, K2O, CaO, Ca, and Mg. The results of this study are in line with* (Hukom, 2020) research that the application of liquid fertilizer without the addition of N in the dry season affects the increase in the active ingredient content of EGCG tea shoots to the highest to reach 12.53%. The EGCG content of rainy season tea shoots is always lower than the dry season, because of high rainfall with long time intervals, resulting in a lot of N nutrients *leaching* out of the plant root area resulting in N stress which affects the decrease in chlorophyll biosynthesis. A higher proportion of chlorophyll A accumulation than chlorophyll B in tea shoots has an effect on epicatechin (EC) and epigalokatekin (EGC) accumulation compared to EGCG. Low levels of chlorophyll B leaves in the rainy season affect the decrease in EGCG levels of tea shoots so that they have low resistance and are very susceptible to damage in the field due to oxidative stress caused by abiotic stress and biotic stress (IRD, 2016).

Furthermore, the influence of the cutting year with the quality of tea leaves showed that in the 4th cut year (2018) and the 1st cut year (2021) there was no significant difference in the content of tea leaves Chlorophyll A, Chlorophyll B, N Tissue, P Tissue, K Tissue, Polyphenols, Cathecins (EGCG), Flavonoids, and Caffein both on Landscape and Panama land. The difference that is not too significant in the content of tea leaves shows that there is no influence of the 4th cut year or the 2nd cut year on the quality of tea plants in the Tambi Plantation Unit (UP) (Purwanto et al., 2014).

When compared with the Tea Plant Quality Standard (SNI 1902: 2016), it was obtained that the Polyphenol content in tea leaves in the Tambi Plantation Unit (UP) still did not meet the > 13 standard, meaning that the content was good but not good enough when compared to the SNI standard. Ramadhani et al. (2017) explained that the bacterial population in the soil in plants that get pruning is different from those that do not get pruning, because plants that are routinely pruned have a smaller number of bacterial populations compared to plants that do not get pruning. Very noticeable differences in bacteria can be noticed after the plants are pruned at the age of 90 days. This explanation is also supported by Ferraro & Oesterheld (in Ramadhani et al., 2017) that pruning done to plants can directly affect plant root biomass which is shown through decreasing the amount of leaf surface area, photosynthetic growth or respiration rate, growth rate, and carbon allocation patterns.

5. The Effect of Cut Year on Tea Leaf Quality

In soil sampling using the instantaneous sample method (Grab Sample), where samples are taken directly from the soil body at a predetermined location with a depth of 20 cm from the soil surface, while leaf sampling also uses the instantaneous sample method (Grab Sample), where samples are taken directly from leaves in plant clumps around a predetermined location. The sampling results obtained the quantity of wet leaves as follows:

Table 12 Quantity of Wet Leaves Cut by UP Tambi Wonosobo Regency

Block	Wet Leaf Quantity (kg/hektar)
Views 2018 (harvest year ke-4)	5.532
Views 2021 (harvest year ke-1)	2.702
Panama 2018 (harvest year ke-4)	3.290
Panama 2021 (harvest year ke-1)	3.188

Source: Tambi Plantation Unit (UP)

The results showed that the highest quantity of wet leaves was obtained at the scenic location in 2018 which was the 4th cutting year with a production yield of 5,532 kg per hectare. Furthermore, the lowest quantity of wet leaves was obtained at scenic locations also in 2021, which was the 1st cut year with a production yield of 2,702 kg per hectare. The decreasing quantity of wet leaves of UP Tambi, Wonosobo Regency in 2021 was influenced by the decreasing amount of rainfall and the amount of dissolved nitrogen in the soil which also decreased.

In the sampling process, it was found that the condition of tea plants in the Tambi Plantation Unit (UP) was the 4th cut year (in 2018) and the 1st cut year (in 2021) there was no significant difference in the content of tea leaves Chlorophyll A, Chlorophyll B, N Tissue, P Tissue, K Tissue, Polyphenols, Cathecins (EGCG), Flavonoids, and Caffein both on Landscape land and Panama land. The difference that is not too significant in the content of tea leaves shows that there is no influence of the 4th cut year or the 2nd cut year on the quality of tea plants in the Tambi Plantation Unit (UP).

When compared with the Tea Plant Quality Standard (SNI 1902: 2016), it was obtained that the Polyphenol content in tea leaves in the Tambi Plantation Unit (UP) still did not meet the > 13 standard, meaning that the content was good but not good enough when compared to the SNI standard.

Ramadhani et al. (2017) explained that the bacterial population in the soil in plants that get pruning is different from those that do not get pruning, because plants that are routinely pruned have a smaller number of bacterial populations compared to plants that do not get pruning. Very noticeable differences in bacteria can be noticed after the plants are pruned at the age of 90 days. This explanation is also supported by Ferraro & Oesterheld (in Ramadhani et al., 2017) that pruning done to plants can directly affect plant root biomass which is shown through decreasing the amount of leaf surface area, photosynthetic growth or respiration rate, growth rate, and carbon allocation patterns.

Conclusion

In testing soil nutrients and tea leaf quality in the Tambi Plantation Unit (UP) with soil sampling procedures using the Grab Sample method, it was concluded that: 1. The results *of the Correlation Test* found that the content of Polyphenols, Catechins (EGCG), Flavonoids, and Caffein is influenced by soil nutrients pH, C org, N, P2O5 available, P2O5, K2O, CaO, Ca, and Mg, meaning that there is an influence between soil nutrients

on the quality of tea leaves in the Tambi Plantation Unit (UP). 2. There is no influence of the cutting year with the quality of tea leaves shown by the results that in the 4th cut year (2018) and the 1st cut year (2021).

In conclusion, it shows that the nutrient content in the Tambi Plantation Unit (UP) has no significant difference in the nutrient content of pH, C org, N, Ca, Mg, and K both on landscape land and Panama land. Very significant differences are only found in the soil content of P2O5, K2O, CaO, MgO, P2O5 available, and CEC. Furthermore, the quality of tea leaves showed results that there was no significant difference in the content of tea leaves Chlorophyll A, Chlorophyll B, N Tissue, P Tissue, K Tissue, Polyphenols, Cathecins (EGCG), Flavonoids, and Caffein both on landscape and Panama land. Therefore, tea farmers in the Tambi Plantation Unit (UP) must continue to maintain the bacterial population in the soil on plants that get pruning by applying the right amount of fertilizer, because plants that are routinely pruned have a smaller number of bacterial populations compared to plants that do not get pruning so that it can affect the plant root biomass which is shown through decreasing the amount of leaf surface area, photosynthetic growth or respiration rate, growth rate, and carbon allocation patterns that will affect the quality of tea leaves in the Tambi Plantation Unit (UP).

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