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# LABORATORY TEST REPORT

May 2024

**Report for : Organiq – Cyber Valley**
**Sampling by : Urban Biologist Bali**
**Sampling date : 16/4/2024**
**Samples tested : 17/4/2024**
**Objectives :**

1. **To understand the bio-property content of the berry *Debregeasia longifolia***
2. **To understand the soil fertility level of the sites**

## SUMMARY

Sample of Debregeasia longifolia and 3 composite soil from 3 sites from the land of Organiq that is located in Desa Gesing, district of Munduk, Buleleng Region, have been tested for the bio-properties (for the berry included heavy metals, nutrients, and phyto-chemical metabolic), standard soil fertility level (for the soil included the physical featured and nutrient content). The test was done at Laboratorium Ilmu Tanah Fakultas Pertanian Universitas Udayana and Laboratorium Bersama Fakultas MIPA Universitas Udayana. The result indicated that the soil was high to excessive of several micro-nutrient and minerals.

The key fundings are described below:

- The Berry *Debregeasia longifolia* contained high amount of Calcium, Magnesium, Tannin.
- The number of percentages of C-organic classified as high – indicated that the soil of the sites was healthy and fertile.

## SAMPLING DETAILS

### Site Details

The site of where samples were taken located in the area called Organiq, a project of Cyber Valley (a private property) in a local village of Gesing, district of Munduk, Buleleng Regency, administratively. That area was located on around -8.29974 S, and 115.08884 E, around 1400 m above sea level.

### Sampling Protocols

There were 2 samples were identified to be examined:

1. The berry *Debregeasia longifolia*, the berries, the leaves and the stem
2. The soil from 3 different location (3 samples of soil)

The whole sites were divided into 3 sites: Coffee Site, Sen Wood Site, and Edem Site. The soil samples were taken representatively at each site using soil auger at 20 points, composited. The samples then packed in the 2x 500 kgs zip-lock paper bag and labelled – total 6 bags of soil samples represented of 3 sites

The berry *Debregeasia longifolia*, identified as a plant belongs to family Urticaceae. It is a wild shrub less then 5 m heigh, with entire lanceolate and serrate leaves and bear stipules, possess type of achenes fruit (berry/strawberry like-fruit) that is red when is ripped.

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The samples of berries (the fruits, the leaves and the stems) were taken only from the site called Coffee Site, by random-exploration method. Each sample were taken as many as 2x 500 g, put in the plastic container and labelled – total 6 container represented fruits, leaves, and stems.

All sample were brough to the lab straight away.

## The Laboratory Procedure

By the time samples arrived at the lab, the sample was stored at the fridge at 4°C for preservation. When it's ready (technically and non-technically based on situation of the lab), each sample were prepared. The preparation of the berry's samples (the fruits, leaves and stems) was done by doing physical destruction of the samples and then were added a strong acid to turn the sample into liquid. The soil samples were prepared by taking out the materials such as gravel, plants roots, and any non-organic residue, and then dry-oven at 40°C. After that, the sample was divided into several group for specific parameter's procedure namely:

1. Laboratorium Ilmu Tanah Fakultas Pertanian Universitas Udayana
    a. pH with direct measurement of acidity degree,
    b. Electric Conductivity, measured by Saturation Extract method,
    c. C Organic, by performing a Walkley and Black procedure,
    d. Nitrogen Total using Kejldhall Method,
    e. Available Phosphorus using Bray – 1 Method,
    f. Available Potassium also using Bray – 1 Method,
    g. Water Content – Permanent Wilting Point by Air Drying in 40°C room,
    h. Water Content – Field Capacity using Gravimetry Method,
    i. Soil Texture by performing Soil Hydrometer and classified with USDA soil classification triangle.
2. UPT. Laboratorium Bersama Fakultas MIPA Universitas Udayana
    a. All the heavy metals - micro-nutrient analysis (Lead, Copper, Magnesium, Manganese, Iron, Cadmium, Zinc, Potassium, Chromium, Calcium, Silicon, Aluminum, Arsenic and Mercury) were using Atomic Absorption Spectroscopy method.
    b. Phyto-chemical metabolism properties (Antioxidant, Flavonoid, Phenol, Tannin, Anthocyanin, Vitamin C and Vitamin A) were using Spectrophotometric method.

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# TEST RESULT

**TABLE 1. LABORATORY TEST RESULT**

| | | | Samples | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Aspect** | **No** | **Parameters** | **Leaves of D. longifolia** | **Stem of D. longifolia** | **Fruit of D. longifolia** | **Soil of Coffee Site** | **Soil of Sen Wood Site** | **Soil of Edem Site** |
| Heavy Metals (Micro-nutrient) | 1 | Lead (Pb) (ppm) | 29,318 | 29,328 | 29,032 | 28,365 | 31,165 | 30,454 |
| | 2 | Copper (Cu) (ppm) | 1,195 | 0,774 | 0,921 | 16,505 | 16,953 | 20,236 |
| | 3 | Magnesium (Mg) (ppm) | 559,674 | 102,226 | 215,281 | 1.176,15 | nd | 1.177,06 |
| | 4 | Manganese (Mn) (ppm) | 3,072 | 0,234 | 0,059 | 171,053 | 173,547 | 196,925 |
| | 5 | Iron (Fe) (ppm) | 30,662 | 35,043 | 6,801 | 8.498,41 | 5.452,49 | 10.409,33 |
| | 6 | Cadmium (Cd) (ppm) | nd | nd | nd | nd | nd | nd |
| | 7 | Zinc (Zn) (ppm) | nd | nd | nd | 15,925 | 15,45 | 16,551 |
| | 8 | Potassium (K) (ppm) | 152,795 | 812,001 | 276,012 | 293,825 | 3436,448 | 2183,664 |
| | 9 | Chromium (Cr) (ppm) | 0,593 | 0,964 | 0,934 | 1,041 | 1,084 | 0,855 |
| | 10 | Calcium (Ca) (ppm) | 28.026,58 | 3.134,28 | 10.374,29 | 29.250,81 | 7.754,06 | 4.355,66 |
| | 11 | Silicon (Si) (ppm) | nd | nd | nd | nd | nd | nd |
| | 12 | Aluminium (Al) (ppm) | 291,649 | 216,61 | 32,905 | 47322,424 | 22761,721 | 18469,499 |
| | 13 | Arsenic (As) (ppm) | nd | nd | nd | nd | nd | nd |
| | 14 | Mercury (Hg) (ppm) | 4,158 | nd | nd | 13,307 | nd | 7,107 |
| Phyto-chemical metabolic property | 15 | Antioxidant (mg/100mL) | not performed | | 21,284 | not performed | | |
| | 16 | Flavanoid (mg/100mL) | | | 18,495 | | | |
| | 17 | Phenol (mg/100mL) | | | 103,297 | | | |
| | 18 | Tannin (mg/100mL) | | | 77.835,29 | | | |
| | 19 | Anthocyanin (mg/100g) | | | 1,529 | | | |
| | 20 | Vitamin C (mg/100g) | | | 96,381 | | | |
| | 21 | Vitamin A (mg/100g) | | | 1,78 | | | |
| Essential Macro Nutrient | 22 | C-organic (%) | not performed | | | 5,46 | 5 | 3,79 |
| | 23 | Total Nitrogen (N) (%) | | | | 0,45 | 0,36 | 0,35 |
| | 24 | Available Phosphorus (P) (ppm) | | | | 10,85 | 8,91 | 10,12 |
| | 25 | Avalailable Potassium (K) (ppm) | | | | 177,83 | 167,7 | 188,67 |
| Physical features | 26 | Water Content - Permanent Wilting Point (%) | | | | 7,84 | 7,02 | 8,06 |
| | 27 | Water Content - Field Capacity (%) | | | | 33,37 | 34,84 | 32,16 |
| | 28 | Texture - Sand (%) | | | | 78,56 | 74,06 | 80,38 |
| | 29 | Texture - Silt (%) | | | | 8,22 | 2,7 | 4,74 |
| | 30 | Texture - Clay (%) | | | | 13,22 | 23,25 | 14,89 |
| | 31 | pH | | | | 6,39 | 6,59 | 6,95 |
| | 32 | Electric Conductivity (mmhos/cm) | | | | 0,36 | 0,34 | 0,21 |

Noted: nd = not detected.

# INTERPRETATION

## The Bio-properties of The Berry *Debregeasia longifolia*

### A. Heavy metals content

There were 14 parameters of heavy metals (or micro-nutrients) examined here in the berry sample. 4 out of 14 were not observed neither at the fruits, leaves or stems, namely Cadmium (Cd), Zinc (Zn), Silicon (Si) and Arsenic (As). The heavy metals Mercury (Hg) was only found in the leaves, not in the fruits nor stems.

It is classified several micro-nutrients (minerals) that commonly found in the plant tissues including leaves, fruits, or stem (roots), were Calcium, Cooper, Iron, Magnesium, Manganese, Potassium, and Zinc, regardless what the species is and possess unique and different amount of those nutrient for each species – thus, the heavy metals-micronutrient profile of this *D. longifolia* were not relevant to compare with other plants species. In this study, Calcium was the richest mineral found in both leaves and fruits of *D. longifolia*, followed by Magnesium and Potassium (in the stems). The other minerals (classified as heavy metals) such as Lead, Cadmium, Chromium, Arsenic and Mercury could also be traced in the plant tissues, but have no metabolic use for plant, instead can give health issue if it consumes and indicate the environmental contamination. In this study, Lead and Chromium

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was observed at all samples (either at the stems, leaves and fruits) – they both were also found in the soil samples, while Mercury was only found in the leaf's samples – indicated that the contamination occurred not from soil uptake, but from deposition, probably from pesticide spraying. This heavy metals-micronutrients profile still couldn't conclude the mineral content of *D. longifolia* or otherwise indicated if there was any concern of incompatibility in term of the standard of the plants, since this study was only focus on *D. longifolia* population at a single site – it requires more samples to be examined from several different sites.

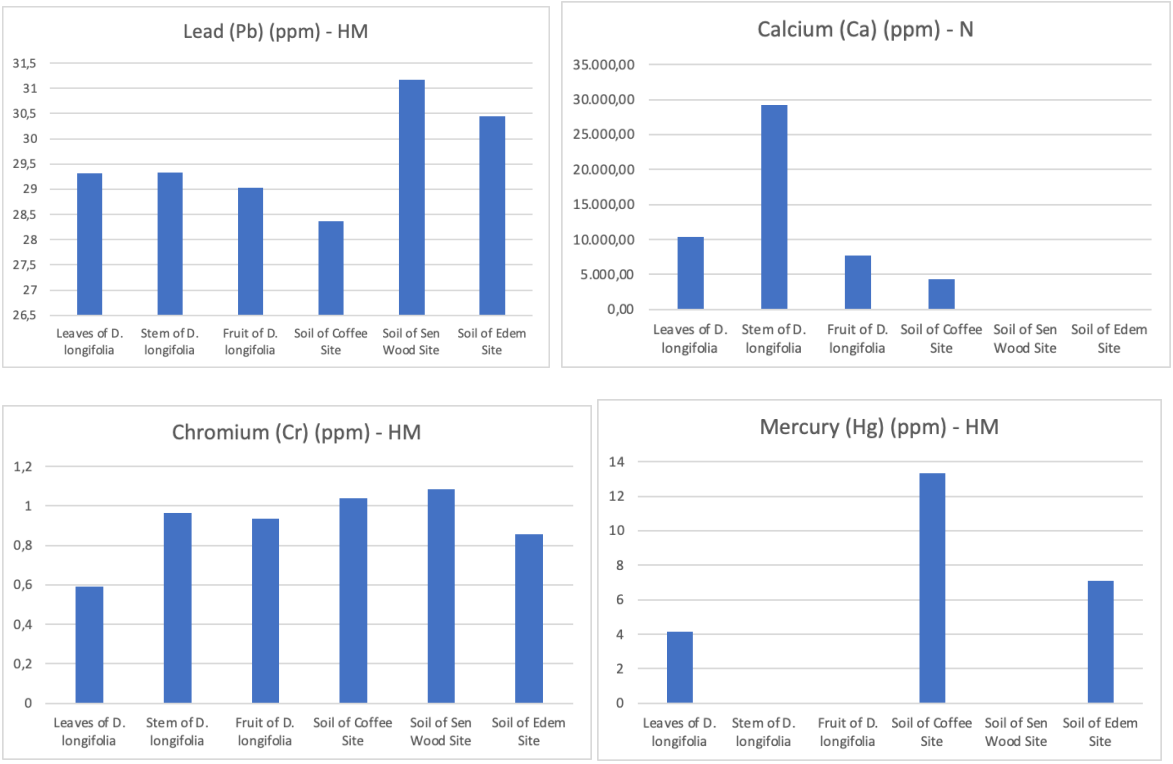


**FIGURE 1. THE GRAPHS OF THE VALUE OF (FROM TOP LEFT TO CLOCKWISE) LEAD, COPPER, MERCURY AND CHROMIUM AT ALL SAMPLES BERRY AND SOIL. LEAD AND CHROMIUM, A HARMFULL HEAVY METALS, WERE OBSERVED BOTH ON SOIL AND BERRY SAMPLES. IT COULD BE SAID THAT THOSE TWO HEAVY METALS WERE ABSORBED, TRAVELED TRHOUGH THE ROOTS, STEM, LEAVES AND ENDED UP IN THE FRUIT. NO MERCURY WAS OBSERVED ON THE STEM NOR FRUIT THOUGHT THE MERCURY WAS FOUND IN TH SAMPLE SOIL OF THE COFFEE SITE. IT MEANS THE MERCURY OF THE LEAVE DID CAME THROUGH THE TRANSPORTATION SYSTEM OF THE PLANT. THE CALCIUM LEVEL WERE SHOWN VERY HIGH DISPITE THE LEVEL OF CALCOUM IN THE COFFEE SITE WAS NOT AS HIGH. THIS INDICATED THAT THIS PLANT TEND TO ACCUMULATED OR SYSTHESIZED THE CALCIUM IN THEIR TISSUE**

## B. Phyto-chemical metabolic property

This is the most interested part as the berry *D. longifolia* are well known as the survival fruit. This fact has been confirmed, since the chemical constituent of this plants has been investigated and showed that this plant can be eaten and be used as medicine [1]. Here in this study, the phytochemical examination was only focus on the fruit. The most significantly abundant metabolism found in this berry fruit was Tannin (77.835 mg/100g), while the other type of metabolism product was not really different level (<100mg/100g). Common fruits that contain high of tannin such as Pomegranate, Grape, Blackberry, Raspberry and Banana, have benefits in lowering total cholesterol, blood pressure, and stimulate the immune system. However, this was actually a very unusual amount of Tannin compared to others berry like Blueberry (160mg/100g), Raspberry (120mg/100g) and Blackberry (75mg/100g) [2]. As the result, consuming this fruit may be good but not recommended to consume it a lot.

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Previous empirical study also mentioned that, not only the fruit that beneficial, but also the leaves, that contained phenolic compounds and flavonoid with a potential antioxidant activity. It was confirmed that the leaves can be eaten as medicine of dysentery, leaves paste could act as poultice for arthritis, skin scabies, a therapy for digestive disorders, and as a cure of a skin illness, indigestion and sunburn [3]. Probably, the phytochemical content of the leaves of the *D. longifolia* in this location should also be investigated in the future.

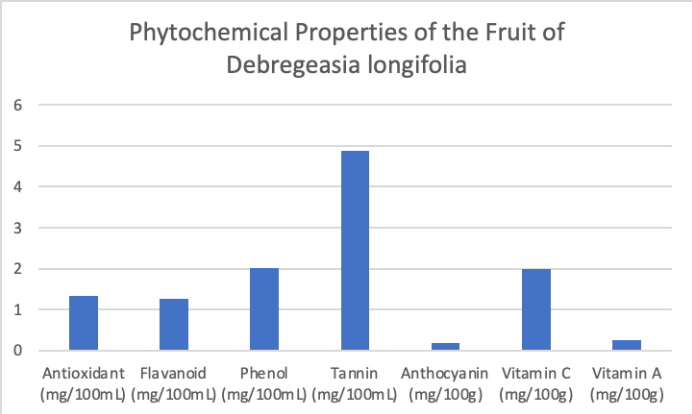


**FIGURE 2. THE GRAPH OF PHYTOCHEMICAL CONTENT OF THE FRUIT OF *D. LONGIFOLIA*. THE DATA WAS TRANSFORM INTO LOG10 IN ORDER TO EASIER THE COMPARATIVE DESCRIPTION OF EACH PROPERTY. AS MENTIONED ABOVE, TANNIN WAS THE MOST DOMINANT METABILISM PRODUCT**

## The Soil Fertility Indicators

### A. Physical feature of the soil

This includes soil texture, pH, electric conductivity, and water content. Based on the lab result, it implied the soil might change rapidly – especially for the water content level (field capacity <50% and permanent wilting point <10%) that was classified as very low, supported by the soil texture with 70% of sand (classified as Loamy Sand, Sandy Clay Loam, and Sandy Loam, respectively), it was lack of water holding capacity, and added with the steep slope contour, the soil was susceptible of runoff and losing their nutrient very quick. The level of electric conductivity was also low. This interpreted as low availability of essential mineral for the plant – although it was found that most minerals (micro-nutrients) were found as high, but it couldn't be easily absorb by the plant, probably because of the lack of solubility due to the lack of water content and sandy texture. Nevertheless, the situation in the field was not that bad since the plant community was very dense, well naturally structured, and matured, simply created a well associated between abiotic and non-abiotic factor in balancing the environment.

### B. Nutrient

This includes C-organic and N P K (Nitrogen, Phosphate and Potassium). The result indicated the high level of soil C-organic – the soil was classified as very healthy and fertile. Soil organic Carbon (C-organic) is the major indicator of soil fertility as it plays important role for the plant's growth and development. In a good soil, soil organic carbon can be ranged around 5% - 10%, while in poorer or heavily exploited soils, levels are likely to be less than 2%. In this study, the samples indicated as high of organic carbon (>5%) at all soil samples. This value was similarly to the common soil in the primary mature forest (this area is a primer forest) and may act as reflection of overall soil health for the whole sites. However, intensive addition of organic matter such as mature compost and covering the topsoil with the dry leaves would literally maintain and even increase the number soil organic carbon rapidly. This should be put as the long-term strategic action plan to maintain the soil fertility level.

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In opposite to soil organic carbon, the N, and especially for available P, and K were very mobile, means that the amount level of each parameter may change over time and sometimes tend to follow the phase of growth of the associated plants (either in seedlings, saplings, blooming or fruiting phases). The level on N (total N) in this study was classified as medium. Planting a kind of nitrogen fixation plants such as group of Legumes will help increase an average total N level in the soil for long-term period.

**TABLE 2. THE LAB RESULT AND SHORT INTERPRETATION OF THE SOIL FERTILITY LEVEL**

| | | Coffee Site | | Sen Wood Site | | Edem Site | |
|---|---|---|---|---|---|---|---|
| No | Parameters | Result | Interpretation | Result | Interpretation | Result | Interpretation |
| 1 | C-organic (%) | 5,46 | Very High | 5 | Very High | 3,79 | High |
| 2 | Total Nitrogen (N) (%) | 0,45 | Medium | 0,36 | Medium | 0,35 | Medium |
| 3 | Available Phosphorus (P) (ppm) | 10,85 | Low | 8,91 | Very Low | 10,12 | Low |
| 4 | Avalailable Potassium (K) (ppm) | 177,83 | Medium | 167,7 | Medium | 188,67 | Medium |
| 5 | Water Content - Permanent Wilting Point (%) | 7,84 | Low | 7,02 | Low | 8,06 | Low |
| 6 | Water Content - Field Capacity (%) | 33,37 | Medium | 34,84 | Medium | 32,16 | Medium |
| 7 | Texture - Sand (%) | 78,56 | | 74,06 | | 80,38 | |
| 8 | Texture - Silt (%) | 8,22 | Loamy Sand | 2,7 | Sandy Clay Loam | 4,74 | Sandy Loam |
| 9 | Texture - Clay (%) | 13,22 | | 23,25 | | 14,89 | |
| 10 | pH | 6,39 | Slightly Acid | 6,59 | Neutral | 6,95 | Neutral |
| 11 | Electric Conductivity (mmhos/cm) | 0,36 | Very Low | 0,34 | Very Low | 0,21 | Very Low |

Regarding the micro-nutrient/heavy metal indicators, several nutrients observed in a quite much quantity such as Aluminum, Calcium, and Iron (Table 1). Those nutrients could occur naturally due to volcanic activity but could also due to over fertilizer – this have to be confirmed by checking what was happening in the sites at the past. Additionally, the Lead and Mercure were also observed in this study indicated there was a contamination from human residential or industrial activity (such construction, farming, mining, etc.).

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