



## Morphological Characterization and Identification of Existing Coffee Types at CSU Lal-lo Valena Site

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**Key words:** *Morphological characterization, Robusta, Excelsa, Liberica, Coffee types*

<http://dx.doi.org/10.12692/ijb/21.6.53-58>

Article published on December 04, 2022

### Abstract

The research was conducted at Cagayan State University Lal-lo, Cagayan from April 2021 to June 2022, to morphologically characterize and identify the existing coffee types in the valena site. Descriptive statistical design was applied. Finding reveals that Robusta, Excelsa and Liberica coffee obtained significant differences in physical and morphological characteristics such as formation, height, roots, leaves, flowers and berries. Thus, Robusta coffee has shallow roots, thin, curly, elliptical shapes with wavy margins leaves, white with five petals flowers, berries borne in heavy clusters, small and roundish and had a thin pulp. Trees are umbrella-shaped and grows 4.5-5 meters. For Excelsa coffee, root is deep, leaves are wide, shiny and bronze-violet, thick but thinner, smoother and more rounded than Liberica, has large white flowers with 6-7 petals. Berries borne in heavy cluster, pulp and parchment are thicker than Liberica and trees reaches 3-4 meters. As to Liberica coffee, root is also deep, leaves are thicker than Excelsa, sideways, lanceolate shaped, white flowers with 6-7 petals, produced the biggest berries among the three coffee types, borne singly or in small clusters, dark red when ripe, pulp is thick, and parchment is woody and have a protruding nipple. Trees are upright, straight trunks and grows 9-10 meters. Moreover, morphological characterization and identification are important for determining the identity of the three coffee types which are already 50-60 years old. Furthermore, rejuvenation, economic valuation and observation of the different life stages are highly recommended to provide readily available data for future coffee studies.

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## Introduction

The Philippine Coffee Industry Roadmap 2017-2022 guarantees a coffee industry that is cost-competitive, aligned with global-quality standards, reliable and environment-friendly, that will provide sustainable benefits to farmers, higher yields and incomes, improved farm productivity and enhancement of farmers' capabilities and skills. Being one of the Higher Education Institutions (HEIs) in region 02, the Cagayan State University, Lal-lo Campus would like to take part in the realization of the visions, missions, goals, and objectives of the Philippine Coffee Roadmap towards revitalizing the coffee as a business industry not only for local product processors but also a source of employment in the countryside and livelihood for farmers and other community people. It also noted that CSU-Lal-lo has 50 Hectares of coffee Plantation. As part of the university's research and extension mission to prime the development of the countryside through the development of research-based production and management technologies of economically important crops such as coffee, this project will provide community empowerment on how to properly grow and manage coffee to produce optimum yield and best quality by-products which may become an added source of income for both the university and target beneficiaries. With the indubitable plunging of the economic growth of the country brought about by the COVID-19 pandemic, this project through the support of partner agencies such as the DOST-RO2 seeks to address technical problems through the development of production and management technologies and other intervention to improve the yield and quality of coffee resulting to better product quality and marketability. Hence, the study aimed to morphologically characterize and identify coffee types at CSU Lal-lo valena site.

## Materials and methods

### *Forging of Memorandum of Agreement (MOA)*

To ensure the smooth implementation of the project, issuance and signing of the Memorandum of Agreement was administered by DOST RO2 Regional Director and Project Coordinator, CSU Lal-lo Project

leader and CSU President to perform the project in well-mannered and had clear roles and responsibilities of both parties in implementing the project.

### *Procurement of supplies and materials*

Agricultural supplies, materials, tools and equipment were purchased prior to the implementation of the study.

### *Site validation/pre-assessment*

Environmental scanning was done prior to the implementation of the project to assess the available resources in the area. Thus, the CSU President and University RDE officials invited the coffee technical experts of the National Capital Region Research, Development and Extension Center (NCRDEC) under Cavite State University to validate and assessed the coffee area of CSU Lal-lo campus.

### *Capability building for the researchers*

Prior to the implementation of the project, a Training of researchers/trainers on Coffee production and processing was done at Cavite State University, Indang Campus under National Coffee Research Development and Extension Center (NCRDEC) to have better knowledge in coffee production, processing and morphological characterization and identification of the four coffee types grown in the Philippines.

### *Actual characterization and identification of the three existing coffee types in the valena site*

The researchers did the actual characterization and identification of the three existing coffee types by characterizing and identifying them morphologically starting from their formation, roots, leaves, flower, fruits, and height and by observing the physical appearance of the coffee trees in the area. Randomly 20 sample plants per hectare were characterized and identified.

### *Finalization of data and interpretation of the results*

The study was used a descriptive type of statistical design. Thus, data was tabulated and encoded in a

Microsoft excel. On the other hand, arranging of photo documentation and interpretation of results were done using a Microsoft Word format.

## Results and discussion

### *Height and formation of trees*

Fig. 1 shows the comparative morphological characteristics of the height of Robusta, Excelsa and Liberica Coffee existing in the Valena Site. Based on the results of the study, there were two (2) variations found, namely shrubs and small trees which were

determined from the height of the coffee plant. Based on their physical appearance, Liberica coffee got the highest height of the plants with a mean of 9-10 meters, the trees are upright with straight trunks, while Robusta Coffee, trees are large, umbrella in shaped and obtained 4.5-5 meters in height, and the lowest height was obtained in Excelsa coffee trees which only reaches 3.0 to 3.5 meters in height and it is bushy. The results implied that the three different types of coffee are having different characteristics.



**Fig. 1.** Comparative morphological characteristics of the three coffee types in terms of height and formation of trees identified at the valena site.

Thus, a similar observation was found in the study of the NCRDEC of Cavite State University last 2014, wherein the height of the Liberica is 9 meters, robusta plants are 4.5 meters and Excelsa plants is 3.0 meters, respectively.

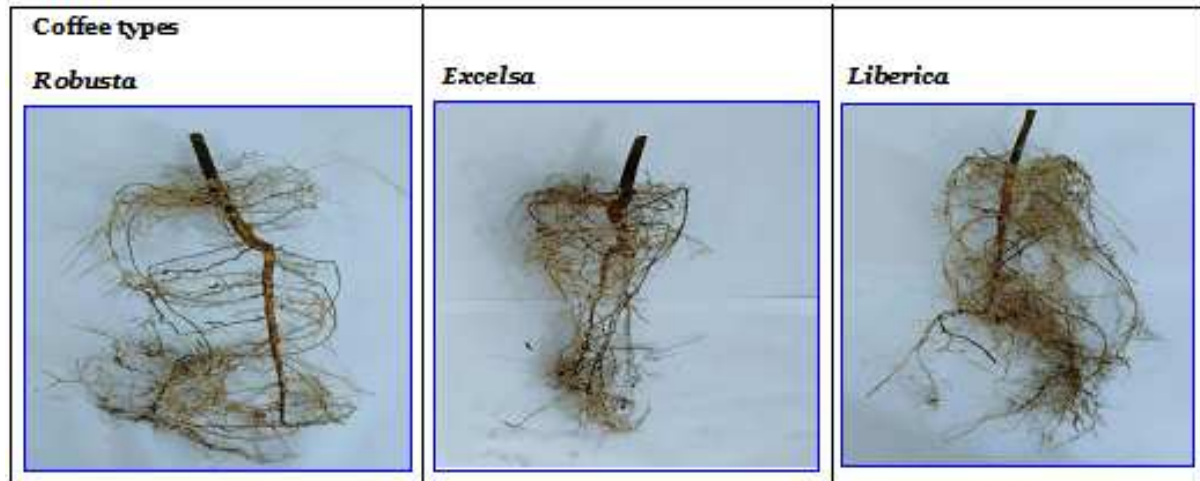
The results of this study are in agreement with the finding of Daniela Dutra Elliott & Paula Mejia Velasquez of Leeward Community College where roots are the plant tissue that we see less often because they are usually found underground, making them the plant tissue that we know the least about.

Roots come in all sizes and lengths, being deeper for trees and more shallow for herbs. Some trees in arid places can grow very deep root systems in search of underground water. On the contrary, Vionita S. *et al* (2021) found out that the Robusta coffee species have wider and thicker leaves. Arabica coffee leaves are dark green, while Robusta coffee is light green.

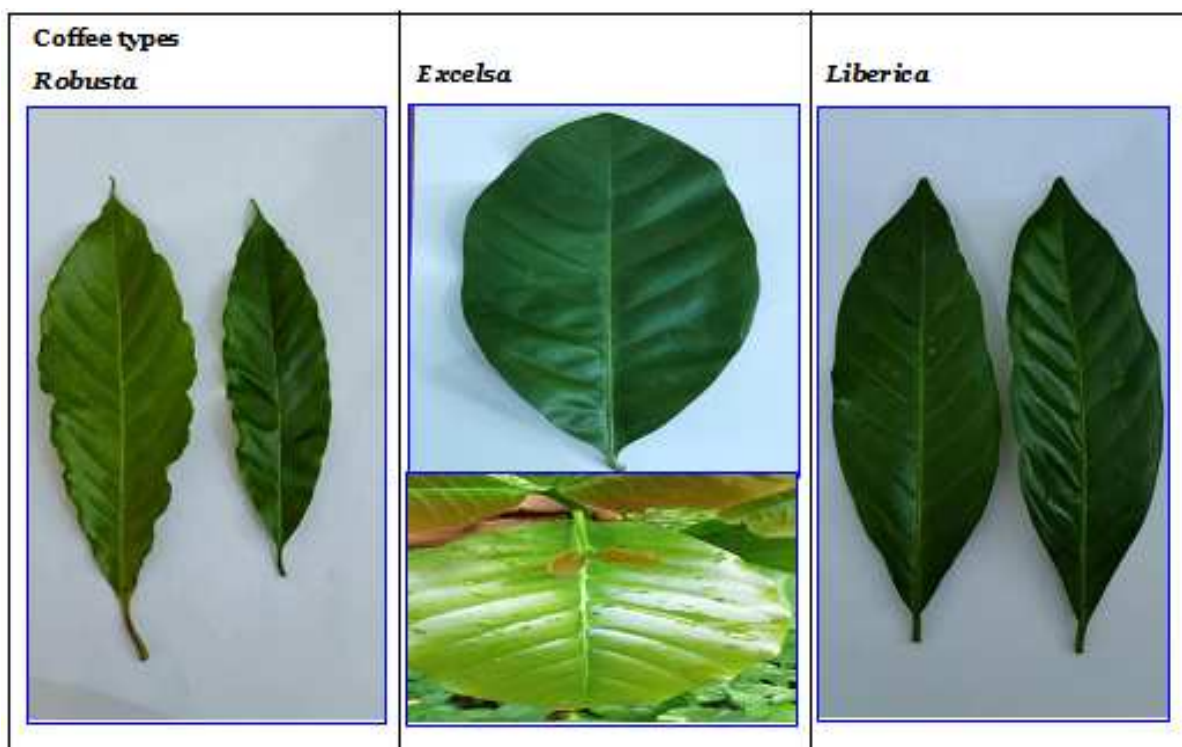
Moreover, Gomez C. *et al* (2016) state that flowering phenology was monitored in a population in the hybrid zone along with temperature and precipitation sequences recorded at a nearby weather station.

The extent and nature of hybridization events were characterized using chloroplast and nuclear micro-satellite markers. Temperature and rainfall are known to be important environmental factors affecting coffee vegetative growth, flowering and bean development

the flowering time of both species does not coincide Noiro *et al.* (2016). The flowering time of *Coffea* species is highly species-specific and genetically controlled, hampering the inter-specific gene flow via pollination.



**Fig. 2.** Comparative morphological characteristics of the three coffee types in terms of roots identified at the valena site.



**Fig. 3.** Comparative morphological characteristics of the three coffee types in terms of leaves identified at the valena site.

Hence, the results of the study in terms of fruit or berries varies differ on their type. Thus, according to Typica last June 6, 2019, the world's first small-scale

direct trade coffee online platform, different varieties of coffee don't just vary in flavor and profile, they're also visually different plants.





**Fig. 4.** Comparative morphological characteristics of the three coffee types in term of flowers identified at the valena site.



**Fig. 5.** Comparative morphological characteristics of the three coffee types in terms of fruit/berries identified at the valena site.

By studying the shape and stature of the tree, as well as the characteristics of berries and leaves, you can more easily identify what kind or types of coffee is being grown or processed.

**Conclusion**

Based from the results of the study, Robusta, Excelsa and Liberica coffee obtained significant differences in physical and morphological characteristics such as

formation, height, roots, leaves, flowers and berries. Thus, Robusta coffee has a shallow roots, thin leaves, curly elliptical shapes with wavy margins, white flowers with five petals, berries borne in heavy clusters, small and roundish and had a thin pulp. Trees are umbrella-shaped and grows 4.5-5 meters. For Excelsa coffee, root is deep, leaves are wide, shiny and bronze-violet, thick but thinner, smoother and more rounded than Liberica, has large white flowers with 6-7 petals. Berries borne in heavy cluster, pulp and parchment are thicker than Liberica and trees reaches 3-4 meters. As to Liberica coffee, root is also deep, leaves are thicker than Excelsa, sideways, lanceolate shaped, white flowers with 6-7 petals, produced the biggest berries among the three coffee types, borne singly or in small clusters, dark red when ripe, pulp is thick, parchment is woody and having a protruding nipple. Trees are upright, straight trunks and grows 9-10 meters.

### Recommendations

Based on the results of the study, morphological characterization and identification is important to have a clearer identity of the three coffee types who are already ages 50-60 years. Furthermore, rejuvenation, economic valuation and observation of the different life stages are highly recommended to get readily available data needed for the succeeding coffee researches.

### Acknowledgment

The authors acknowledged the DOST RO2 for funding the research, NCRDEC staff of Cavite State University for the technical assistance during the conduct of the study and Cagayan State University University President, Dr. Urdujah G. Alvarado and RDE Officials for their unending support.

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