

Exploration and Characterization Parental Strain of The Gambir (*Uncaria gambir* (Hunter) Roxb.) in Lima Puluh Kota Regency

Sulastri, Nin Patri Enati , Fefriyanti . D.S. Ratna Agustia and Yuliatr

Department of Plantation Crop Production Technology Politeknik Pertanian Negeri Payakumbuh, Payakumbuh 26271, Indonesia

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Corresponding Author:
Sulastri, Department of Plantation
Crop Production Technology
Politeknik Pertanian Negeri
Payakumbuh, Payakumbuh 26271,
Indonesia
Email : Sulastri9003@gmail.com

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Abstract

This study aims to explore and characterize gambir strains (*Uncaria gambir* (Hunter) Roxb.) in Lima Puluh Kota Regency to obtain superior varieties with high yield potential and good gambir quality. The research was conducted through field exploration to find naturally growing and cultivated gambir trees. Leaf and stem samples were collected from selected trees for morphological, anatomical, and genetic analysis. The results showed several good gambir quality characteristics in Lima Puluh Kota Regency. Analysis of plant morphology showed the absence of genetic diversity in plants cultivated in gambir populations in the study area. This study succeeded in identifying strains of gambir parental that have the potential to be a source of seeds for the development of superior varieties. The results of this study provide valuable information for the conservation and development of gambir plants in Lima Puluh Kota District

Keywords: characterize, exploration, gambir, morphology, strains

1. Introduction

West Sumatra is one of the gambir producing areas after South Sumatra, Riau and Bengkulu. (GPEI, 1991; Denian, 2000). Gambir cultivation in several production centers in West Sumatra has been going on for a long time and is the main livelihood for farmers in the area. Gambir is one of the plantation commodities that has become an important export commodity. In 2024, gambir exports reached 7,913 tons, valued at US\$133,80 juta (BPS Lima Puluh Kota 2024).

The export market share of gambir still has potential because Indonesia supplies 2.43% of the world's needs. To meet domestic needs, Indonesia imports 2,599 tons of gambir, or 1.70% of total world imports (Munir, 2000). The main problem of gambir in production centers is low productivity and quality, which is only about 300 - 450 kg/ha of dried gambir sap (Roswita, 1990; Disbun Sumbar, 2000).

One of the constraints of gambir farmers is the low production due to the use of planting materials (seeds) of unknown parent origin. Then, there is a low use of technology in cultivation. Farmers do not fertilize, and harvesting methods are not optimal. While the low quality of gambir products is due to the harvested material, one way to overcome the constraints of gambir plant productivity is to use planting materials (seeds), gambir superior varieties suitable for each production center in Lima Puluh Kota Regency.

Knowing the character of the parent tree as germplasm is essential to determine its potential and

diversity. Germplasm variation based on morphological traits has been widely practiced. In tea plants, morphological characteristics such as plant shape, leaf shape, young leaf color, and fruit shape can be used to identify clones (Jou-Ann-Lai et al., 2001).

Exploration and characterization of parental trees are carried out to inventory gambier germplasm. In some production centers, information was obtained that farmers generally use seeds derived from the Udang, Cubadak, or Riau types (Denian and Fiani, 1994). It is from these three derivatives that gambier is traditionally cultivated in the West Sumatra region; therefore, derivatives of the three types will be found in each production center. These three types have grown for generations in a long period (thought to have been hundreds of years) in each production center (Denian and Fiani, 1994), and landrace formation is possible. Research was conducted in production centers in Lima Puluh Kota District to determine the diversity and existence of gambier plant types in production centers.

The research was conducted by observing morphological traits to determine the kinship between the selected gambir mother tree accessions. The kinship between these accessions needs to be known about the further utilization of germplasm for plant breeding purposes (selection of elders for crosses), to obtain gambir accession characters by production centers and for plant conservation.

2. Materials and Methods

This research began in June 2024. The initial stage was coordination with the Harau Sub-district BPP Coordinator to obtain information about gambir-producing areas in Lima Puluh Kota District. The District BPP Coordinator recommended three regions: Jorong Ketinggian, Jorong Harau, and Jorong and Jorong Landai. The parameters observed were

qualitative characters and quantitative characters. Quantitative characters It consisted of clump height, branch length, branch diameter, twigs, and harvested leaves, twigs, leaves, flowers, and fruits.

Qualitative characters include twig color, leaf upper surface color, leaf lower surface color, shoot color, old leaf bone arrangement, young leaf bone arrangement, flower color, young fruit color, and mature fruit color.

3. Results and Discussion

Exploration and identification of morphological characteristics of gambier plants at three sampling locations on the land of the Cape Flower Farmer group In Nagari Harau, Harau District. The following are the location and coordinate points of sampling observation.

Table 1 Sampling location point Observation

No	observation location	coordinate point
1.	WJCR+Q8R Harau, Kabupaten Lima Puluh Kota, Sumatera Barat	0°04'40.9"S 100°38'26.8"E
2.	VM73+2HJ, Sarilamak, Kec. Harau, Kabupaten Lima Puluh Kota, Sumatera Barat	0°08'13.1"S 100°39'15.5"E
3.	VM73+27Q Sarilamak, Kabupaten Lima Puluh Kota, Sumatera Barat	0°08'14.7"S 100°39'11.6"E

Sample observation locations are in 2 Nagari, namely Nagari Harau and Nagari Sarilamak. Gambir in Nagari Harau and Nagari Sarilamak grows on sloping topography; the slope ranges from 15 - 45 degrees with altitudes ranging from 500 to 850 meters. Morphologically, a place's altitude and degree of slope have no effect on the morphology of the gambir plant but will affect the harvest age and catechin content. The altitude of the place above sea level (above sea level) will cause differences in weather.

And climate as a whole in that place, especially temperature, humidity, and rainfall. (Sangadji, 2001). Gambir can grow 50-1,100 meters above sea level (Sebayang, 2013). affects the length of production and the quality of the gambir produced (Kasim, 2015). According to Dhalimi (2006), gambir harvesting is generally carried out twice a year depending on the state of plant growth and leaf senescence; if growth is good and leaf senescence meets the requirements, harvesting can be done three times a year.

Based on the results range and average values of morphological characteristics of Gambir Plants in

Harau District (Table 2) it can be concluded that the plants resulting from this exploration are gambir plants at 3 locations that are not too different. Gambir plants observed are more than 20 years old, so the plants are already very tall, and the branches are also very long, ranging from 300 to 380 cm. The complete data can be seen in the table below.

It is a shrub plant with climbing branches; when young, the gambir plant has a rectangular stem. Gambir leaves are single, have a slightly slippery texture, and are green in color. On one branch, several twigs are parallel or have the same direction between one leaf and another (Amos, 2004). The primary reinforcement of the leaf at the bottom is prominent. Gambir leaves have hooks between the two petioles (Sugito, 2017). It is known that the morphological characteristics of gambir plants in the Harau sub-district of Lima Puluh Kota Regency only have slight differences between plants at three sampling location points

Table 2. Range and Average Values of Morphological Characteristics of Gambir Plants in Harau District

Morphological Character	Range	Average
Clump Height (cm)	250 – 350	300
Branch Length (cm)	300 – 380	340
Branch Diameter (cm)	0,5 – 1,5	1
Twig Diameter (mm)	0,25 – 0,5	0,3
Leaf Length (cm)	10 – 16,5	13,25
Leaf Width	5 – 7	6
Twig Color	Green – Red	Red
Leaf Upper Surface Color	Light Green - Dark Green	Dark Green
Leaf Bottom Surface Color	Green–Red	Green
Shoot Color	Red Dark	Red Dark
Young Fruit Color	Green- Yellow	Green
Old Fruit Color	Red Dark	Red Dark



Picture 1. Morphological Characteristics of *Uncaria gambir* Flower (*Uncaria gambir* Roxb.) young Fruit color green- yellow and green

Flowers are the most essential part of plant breeding activities. The flowers of gambir (*Uncaria gambir* Roxb.) are in the form of round cones with green color when young and reddish yellow when blooming. Flowers are compound, Bangkok-shaped, opposite in the leaf axils, flat stalks, with a length of

4. Conclusions

Gambir is the leading plantation commodity in Lima Puluh Kota Regency, from the observation of identifying and characterizing the strains of gambir (*Uncaria gambir* (Hunter) Roxb.) elders in Lima Puluh Kota Regency to obtain superior varieties that have high yield potential and good gambir quality. The research was conducted through field exploration to find naturally growing and cultivated gambir trees. Leaf and stem samples were collected from selected trees for morphological, anatomical, and genetic analysis. The results showed several gambir varieties with characteristics that do not vary in the Lima Puluh Kota

0.5 - 4.2 cm and a Bangkok diameter of 4.7 - 5 cm; the corolla tube is flat, red, and finely haired; the corolla lobes are whitish beige, and the protective leaves are hairless and lanceolate. Fruit is capsule-shaped, narrow, long, and divided into two hemispheres. Seeds are numerous, small, smooth, needle-shaped, and winged, with a length of 0.4 cm (Sampurno et al., 2007). Regency. Analysis of plant morphology showed the absence of genetic diversity in plants cultivated in gambir populations in the study area. This study succeeded in identifying strains of gambir elders that have the potential to be a source of seeds for the development of superior varieties. The results of this study provide valuable information for the conservation and development of gambir plants in Lima Puluh Kota District

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References

- [1] BPS Lima Puluh Kota. 2024. <https://limapuluhkotakab.bps.go.id/id/pressrelease/2024/03/01/754/nilai-ekspor-asal-sumatera-barat-januari-2024-mencapai-us-133-80-juta-dan-nilai-impor-sumatera-barat-januari-2023-mencapai-us-37-04-juta> diakses pada 07 Februari 2024
- [2] Denian, A., 2000. Productivity of some gambier genotypes in dry highland areas. Proceedings of PERHIMPI Bogor. pp 420 - 425.
- [3] Denian, A. and A. Fiani, 1994. Morphological characteristics of some gambir plant numbers. Proceedings, Seminar Littro Solok (4). 5 pp.
- [4] Disbun West Sumatra, 2000. Gambir and Patchouli Development Policy in West Sumatra. Pros. Gambir and Patchouli Processing Technology Workshop. Balitro. Solok January 24-25, 2000. pp. 29-35.
- [5] Endah, L. S., P. Nunik, S. Ariyanti and H. Sunarso, 2003. Relationship of 18 Taro (*Colocasia esculenta* (L.) SCHOTT) collections from Bogor based on morphological and isozyme characters. Collection of Abstracts of the X PERSADA National Seminar. Bogor. 156 p.
- [6] GPEI, 1991. The ins and outs of gambier trade in West Sumatra. Paper presented at a workshop for gambier farmers and traders in Bangkalan Kec. - Kab. 50 Kota. Unpubl. 23 pp.
- [7] Herman, H., 2000. Export Potential of Specific Commodities of West Sumatra with Great Prospects in the Future. Proceedings of Gambir and Patchouli Processing Technology. Balitro. Solok January 24-25, 2000. Solok: 60-69. Bul. Littro. Vol. XIX No. 1, 2008, 18 - 38 32
- [8] Huaman, Z. and D.M. Spooner, 2002. Reclassification of landrace populations of cultivated potatoes (*Solanum* sect. *Petota*). American Journal of Botany 89: 947-965. Jou-Ann Lai, Yang W. C. and J. Y. Hsiao, 2001. An assessment of genetic relationships in cultivated tea clones and native wild tea in Taiwan using RAPD and ISSR markers. Bot. Bull. Acad
- [9] Karuniawan A., 2005. Analisis multivariat sifat-sifat morfologi pada ubijalar *Pachyrhizus erosus*. Zuriat vol 16 (1) : 44-51.
- [10] Mansyah, E., A. Baihaki, R. Setiamihardja, J.S. Darsa, Sobir dan R. Poerwanto, 2003. Variabilitas fenotipik manggis pada beberapa sentra produksi di Pulau Jawa. Jurnal Hortikultura Vol. 13 (3) : 147-156.
- [11] Munir, M., 2000. Prospek dan Kendala Ekspor Gambir. Pros. Gelar Teknologi Pengolahan Gambir dan Nilam. Balitro. Solok 24-25 Januari 2000. hal. 70-74.
- [12] Roswita, D., 1990. Prospek tanaman gambir di Sumatera Barat. Bul. Informasi Pertanian (01). Balai Informasi Pertanian. Padang. hal. 8-10.
- [13] Souza, E. and M.E. Sorrels, 1991a. Hubungan kekerabatan di antara 70 plasma nutfah gandum Amerika Utara : II. Analisis kluster dengan menggunakan karakter kualitatif. Crop Sci 31 : 605-612.
- [14] Souza, E. and M.E. Sorrels, 1991b. Hubungan kekerabatan di antara 70 plasma nutfah gandum Amerika Utara : I. Analisis kluster menggunakan karakter kuantitatif. Crop Sci 31 : 599-605.
- [15] Szczepaniak M, E. Cieslak dan P.T. Bednarek, 2002. Variasi morfologi dan AFLP dari *Elymus repens* (L.) Gould (Poaceae). Cellular & Molecular Biology Letters. Vol. 7 : 547- 558. Vafaie-Tabar, M., S. Chandrasekaran, R.P. Singh and M. Rana, 2003. Evaluasi keragaman genetik pada kapas tetraploid dan diploid India (*Gossypium* spp.) berdasarkan karakter morfologi dan RAPD. Indi Profil Kecamatan Harau. <https://kec-harau.limapuluhkotakab.go.id/>