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Identification of dendrobium Natural Orchids in Liwa Botanical Garden based on leaf morphological characters

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ABSTRACT

Lampung is one of the provinces on the island of Sumatra which has a flora conservation area, which is located in Liwa Botanical Garden, West Lampung Regency. One of the flora species in the area with a high level of diversity is the orchid plant. The largest number of orchid species is the Dendrobium orchid species, where this orchid is widely hunted by the public as an economic reason, due to the beauty of its various flower shapes and colors. Given the high level of human encroachment, this can threaten the existence of natural orchid plants, causing loss of their original habitat and causing extinction of orchid species. Based on data in Liwa Botanical Garden, there has been no further identification of natural orchids as a plant conservation effort. To protect and immediately save these natural orchids, it is necessary to identify the Dendrobium orchid species based on the leaf morphological approach. This research will be conducted in April-September 2020. Observations of leaf morphology include leaf shape, leaf tip shape, leaf base shape, leaf edge, leaf reinforcement, leaf arrangement, leaf surface texture, leaf symmetry and leaf sitting based on guidelines for ornamental plant characterization books. Observations as secondary data were added to the character of the pseudobulb shape and orchid habitat. Observations as secondary data were added on the habitat character of pseudobulbs and orchids. The implementation of this activity is still in the period of the Covid-19 pandemic so most of the activities are carried out online. The coaching and training phase was conducted through internal virtual discussions on Tuesday, July 7, 2020, while the coaching phase was conducted through meetings or verbal communication via telephone groups and WhatsApp. ased on the evaluation data, it is known that there is an increase in knowledge and understanding of training participants by 21.64 points. The percentage increase in value before and after training is 34.72%.Orchid -related activities at Liwa Botanical Garden were never carried out, thus imparting knowledge to Liwa Botanical Garden technicians and workers on the development of natural orchid identification methods based on morphological character in local natural resource conservation in the 4.0 industrial revolution era.

KEYWORDS
Orchid
Dendrobium
Identification
Leaf morphology

1. Introduction

The existence of natural orchids as the mainstay of the collection of the Liwa Botanical Gardens is a wealth of native flora of Southern Sumatra that really needs to be preserved. Based on previous research [1], it is known that many natural orchid individuals have not been identified, including the Dendrobium orchid. Based on direct information from the Head of PLT Botanical Gardens Liwa, Mr. Sukimin, S.Ip., M.M., it is known that the management does not yet know how to identify natural orchids in the Liwa Botanical Gardens. This service activity is developing the identification method of Dendrobium natural orchids in the Liwa Botanical Gardens based on the morphological characters of leaves and pseudobulbs. This identification activity can be used as basic data for plant conservation efforts through species

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inventory [2]. Survey activities and orchid conditions in Liwa Botanical Gardens are presented in Figure 1. The existence of natural orchids becomes a mainstay collection of the Liwa Botanical Garden, which is a wealth of Southern Sumatra native flora that really needs to be preserved. Based on previous research [1], [2], it is known that many natural orchids which have not been identified, including the Dendrobium orchid. Based on direct information from the Head of PLT Liwa Botanical Garden, Mr. Sukimin, S.Ip., M.M. it is known that the management does not know yet the method of identifying natural orchids at the Liwa Botanical Garden. This community service activity is the development of an identification method of the Dendrobium natural orchid in the Liwa Botanical Garden based on the morphological characters of leaves and peseudobulb. This identification activity can be used as basic data for plant conservation efforts through species inventory [2]. Survey activity and the condition of orchids in the Liwa Botanical Garden are presented in Figure 1.

Fig. 1. Survey activity at the Liwa Botanical Garden orchid green house

Considering the high increase in exploitation due to irresponsible community encroachment, natural orchid can be threatened by their existence which causes loss of their natural habitat. Therefore, the Liwa Botanical Garden is expected to ensure the preservation of natural orchid species which can be used sustainably. Given the importance of maintaining and preserving orchids in the region, it is necessary to follow up. From the description above, efforts that can be made to quickly preserve orchid germplasm are by providing training to employees at the Orchid Botanical Gardens so that they can identify based on leaf morphological characters as the main data and identify habitat and type of pseudobulb as supporting data. With the development of this method, it is hoped that the identification process of natural orchids can be done more accurately and quickly. This service highlighted the development of biological control methods for viral diseases using endophytic mycorrhizal biological agents [3]. The effectiveness of this method is strengthened by the induction of plant disease resistance and the use of an expert system method for diagnosing plant diseases using a web-based case-base reasoning method [4]. This service is important considering that the botanical gardens do not know the methods of controlling disease in orchids that are safe and environmentally friendly compared to pesticides. In addition, this activity has never been carried out, it is proven that there is no publication regarding this matter. Based on the explanation above, this community service is very important to be carried out which can be media for sharing good knowledge between the service team and the manager of the Liwa Botanical Garden. With the development of this method, it is hoped that the identification process of natural orchids will be more accurate and faster. In addition, the activity to identify orchids in the Liwa Botanical Garden has never been carried out. It is proven that there is no official publication, so the information is still very limited.

2. Method

This activity was conducted in stages from April to September 2020. This activity is a form of collaboration with the Liwa Botanical Garden as a partner. Besides, it also involves 3 students of the Biology Department, FMIPA, University of Lampung through Field Work Practices (PKL) at the Liwa

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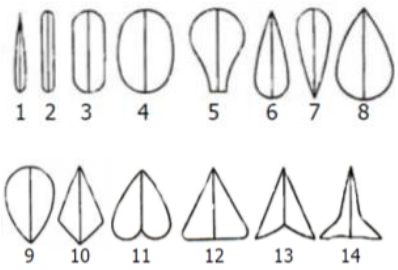
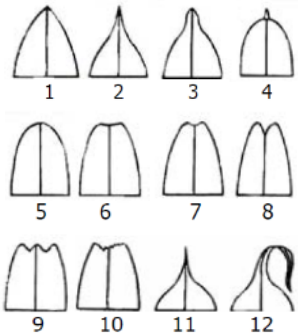
Botanical Garden. They are Mailinda Anggreni, V Dwi Anggita Sari, and Eka Nuraini Tohari. The results of this service are expected to provide solutions that are in accordance with existing conditions in the field. The problem-solving framework and activity output targets are presented in Table 1.

Table 1. Problem solving framework and activity output targets

Problems	Solutions	Output Target
Employees do not have knowledge on how to identify orchid plants properly	Employees are given knowledge about the identification of orchid plants in the field	Increase employees knowledge in identifying orchid plants in the field
There has never been any training regarding the identification of orchid plants	Training on the identification of orchid plants should be provided	Improve employee skills in identifying crops in the field

The method of implementing this activity is carried out in three stages, namely counseling, training, and mentoring. Counseling was carried out by providing information and discussions with field technicians and managers of the Liwa Botanical Gardens [5], [6]. The training was conducted so that field technicians and managers of the Liwa Botanical Garden have the ability to identify plant morphology. Furthermore, this periodic mentoring aims to create independence through sharing knowledge between field technicians and managers of the Liwa Botanical Garden. The delivery of the material was carried out using a lecture method, question and answer, and discussion. The material given was how to identify orchids based on the main character (leaf morphology) and supporting characters (pseudobulb type and habitat). The identification of orchids based on the main morphological characters of the leaves is presented in Table 2.

Table 2. The main character of orchid identification is based on the morphological characters of the leaves [7]

Shape	Characters of the Leaves	Images
Leaf shape	1. Needle shaped 2. Band-shaped/straight 3. Oval 4. Ellipse/oblong 5. Spoon-shaped 6. Lanceolate/javelin shaped 7. Breech lanceolate/reverse lanceolate 8. Round egg 9. Round breech eggs 10. Shovel shaped 11. Heart shaped 12. Triangles 13. Arrow-shaped 14. Spearhead	
Shape of the tip	1. Taper/sharpen to the end 2. Tapered with sharp sides 3. Shared pointed 4. Pointed-tipped pointed vulnerability 5. Tumpul. 6. Shape peat/ cut 7. Romping/blunt little 8. Torn up, tip splitting 9. Third toothed 10. Serrated 11. Brush shaped 12. Tail	
Leaf cross section	1. Menggalah 2. Zygomorph/pressed symmetry type 3. Fold 4. Not duplicate	

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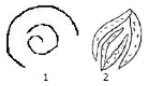
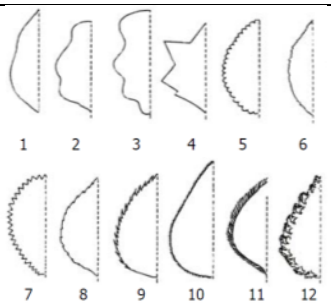
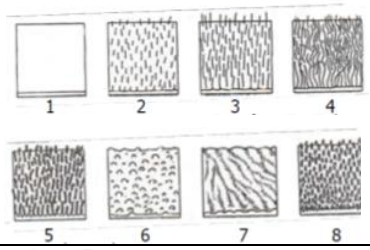
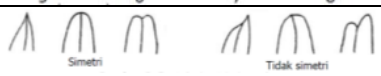
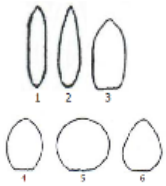
Leaf arrangement	1. Coiled together 2. Duplicate	
Leaf edge shape	1. *Mengutuh* 2. Waving 3. Crooked 4. Angled / faceted 5. *Beringgitan* 6. Cracked 7. Serrated 8. Sawing 9. Double saws 10. Frayed 11. *Kelijak*, like eyelashes 12. Curling	
Leaf surface texture	1. Bald 2. *Meroma* (covered in fine hairs rarely) 3. *Memisai* (covered in long, slightly stiff hairs) 4. *Mengewol* 5. *Menepung* 6.*Berbingkahan* (irregular surface) 7. Wrinkled 8. Berpapil (Diedit)Pul	
Leaf symmetry	Simetri Tidak Simetri	
Duduk daun	Rapat Berselang seling	 Rapat  Berselang seling

Supporting Characters:

- Pseudobulb; Another orchid character is the pseudobulb type. The types of pseudobulbs in several Dendrobium species that have been found can be seen in Table 3. For further information, this can be used as a reference in exploratory research in the field.

Table 3. Supporting characters for orchid identification based on pseudobulb shape characters [7]

Shape	Pseudobulb form	Images
Pseudobulb shape	1. Band-shaped/ straight 2. Cuff/ javelin shape 3. Oval 4. *Jorong/ ujur telur* 5. Round 6. Round egg	

- Habitat; Orchids have variety of places to live such as: epiphytic, terrestrial, lithophyte, or others

3. Results and Discussion

The implementation of this community service activity is still in the period of the Covid-19 pandemic so most of the activities are carried out online. Counseling and training activities were carried out through internal virtual discussions on Tuesday, 7 July 2020 with the theme "Application of Appropriate Technology in the Industrial Age 4.0 in Identifying Orchids and Diseases in the Liwa Botanical Garden" as shown in Figure 2.

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Fig. 2. Poster of virtual discussion "Application of Appropriate Technology in the Industrial Age 4.0 in Identifying Orchids and Diseases in the Liwa Botanical Garden"

It should be noted that this virtual discussion involved two community service activities that were carried out at the Liwa Botanical Garden. In addition, this was an internal program, therefore the participants are limited to technicians of the Liwa Botanical Garden and students of the Biology Department, FMIPA, University of Lampung who are involved in Field Work Practices (PKL) and orchid research at the Liwa Botanical Garden. This was applied to keep the participants focused, more enthusiastic, and dare to ask questions if there are things which are not clear. The participants in this activity involved 47 people from the Liwa Botanical Garden and 15 people from the University of Lampung. The event was opened by Ir. Noviardi Kuswan, as the Head of the Research and Development Agency for West Lampung District and continued with the presentation of the material by the speakers. Related to the title of community service, the material presentation was carried out by Dra. Tundjung Tripeni Handayani, M.S. with the title "Identification of Orchids based on Morphological Characters" and Dr. Sri Wahyuningsih, M.Si. with the title "Identification of Orchids based on Anatomical Characters". Furthermore, the training stage was carried out shortly after the counseling stage through the presentation of the material has been finished. This stage is the practice of both presenting the material and measuring the understanding of the participants in the activity. The results obtained are known through the evaluation of the training participants. Evaluation aims to collect data both during the process and the results that have been achieved through training activities. This evaluation is to obtain input that can be used as a basis for further activities to be carried out. The evaluation in this activity is carried out in three stages: at the beginning through the pre-test, during the lecture process through discussion and training accompanied by questions and answers, and at the end of the activity through the post-test.

In general, many participants know about identification. All training participants (100%) know that one type of natural orchid in the collection of the mainstay of the Liwa Botanical Garden is Dendrobium. Knowledge about this type of orchid is important for training participants because it is the basic knowledge in orchid preservation. In addition, the data shows that until now many of the Dendrobium orchids in the Liwa Botanical Garden collection have not been identified. The same thing was also obtained, where all participants (100%) had never heard the term identification based on morphological, anatomical, and molecular characters. However, one of the training participants (4.54%) who reported having received

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counseling on the naming of plants, and only 2 participants knew (9.09%) that nomenclature was the final result of the identification activity. 5 participants (22.72%), knew one of the orchid organs that was easiest to identify at any time, which is the leaf. There are also very few participants (13.63%) who know the orchid plant where its peculiarity is in the flower organ. Different data was obtained, where all participants (100%) do not know that pseudobulb and habitat characters are included in the morphological identification. A small number (13.63%) know the difference between terrestrial, epiphytic, lithophyte, and saprophytic habitats. All participants (100%) did not know the types of anatomical and molecular characters in plant identification.

Based on the evaluation data obtained, it is known that there has been an increase in the knowledge and understanding of the training participants regarding the identification of Dendrobium orchids at the Liwa Botanical Garden based on leaf morphological characters. The pre-test mean score was 56.36 and after the provision of material and training to the participants there was a significant increase. The post-test mean result was 78. There was an increase of 21.64 points. The percentage increase in value before and after training was 34.72%. With this high percentage value shows that the transfer of knowledge was successful [6], [8]. It is hoped in the future that it is not only limited to increasing knowledge and understanding in training participants, but it can be applied in daily life independently in the identification of natural orchids in the collection of Liwa Botanical Gardens. The stages of mentoring activities are carried out through communication between the Liwa Botanical Garden technicians and the presenters as lecturers in the Department of Biology, FMIPA, University of Lampung intensively either through meetings, or through verbal communication via phone and WhatsApp group. Mentoring activities are also carried out through Field Work Practices (PKL) for Biology Department Students, FMIPA, University of Lampung. The entire orchid identification method based on leaf morphological characters which is the product (output) of this community service activity was adopted by the Liwa Botanical Garden as an effort to develop and preserve natural orchid collections that complement anataomic and molecular identification data. Furthermore, it can be pursued as an Appropriate Technology to identify orchids in the industrial era 4.0.

4. Conclusion

The implementation of these service activities is still in the period of the Covid-19 pandemic so most of the activities are carried out online. The counseling and training stages were carried out through internal virtual discussions on Tuesday, 7 July 2020 with the theme "Application of Appropriate Technology in the Industrial Age 4.0 in Identifying Orchids and Diseases at the Liwa Botanical Garden." The mentoring stage was carried out through meetings or verbal communication via phone and WhatsApp groups. Based on the evaluation data, it is known that there is an increase in the knowledge and understanding of the training participants. The pre-test mean score was 56.36 and after the provision of material and training to the participants there was a significant increase. It can be seen from the post-test mean result which was 78. There was an increase of 21.64 points. The percentage increase in value before and after training was 34.72%. The hope in the future is not only limited to increasing knowledge and understanding in training participants, but it can be applied in daily life independently in the identification of natural orchids in the collection of Liwa Botanical Gardens. Identification of orchids based on leaf morphological characters which is the product (output) of this community service activity was adopted by the Liwa Botanical Garden as an effort to develop and preserve natural orchid collections that complement anataomic and molecular identification data in the industrial era 4.0.

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