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Phanerogamae Species in The Post-Liquefaction Area of Balaroa Subdistrict, Palu City

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Abstract

Phanerogamae are classified as plants with the highest level of phylogenetic development because they produce seeds. Ontogenetically, seeds function as the generative reproductive structures of these plants, as their formation is preceded by sexual reproduction. This study aimed to identify and describe the morphological characteristics of Phanerogamae plants in the post-liquefaction area of Balaroa Subdistrict, Palu City. The research was motivated by the limited scientific information regarding plant species capable of growing and adapting to post-liquefaction environments. A descriptive-exploratory method was employed through direct field observations and morphological identification based on root, stem, leaf, flower, fruit, and seed characteristics. The results revealed the presence of 22 Phanerogamae species belonging to two classes and twelve orders, exhibiting diverse morphological characteristics and varying patterns of vegetation distribution. Several species were found to dominate specific areas according to habitat conditions, such as waterlogged zones and open lands formed after the disaster. The study concludes that the post-liquefaction area of Balaroa Subdistrict continues to support the growth of various Phanerogamae species that possess the capacity to adapt to environmental changes.

Keywords: Phanerogamae; morphological characteristics; post-liquefaction area; plant diversity; vegetation distribution.

INTRODUCTION

Indonesia is recognized as one of the most geologically disaster-prone countries in the world due to its location at the convergence of three major active tectonic plates: the Eurasian, Pacific, and Indo-Australian plates. The rapid movement of the Indo-Australian and Pacific plates contributes to the high frequency of tectonic earthquakes across various regions of Indonesia (Wiwin & Nuraedah, 2022). This geological setting places Indonesia at a high risk of earthquake occurrences, which not only cause severe damage to settlements and infrastructure but also trigger secondary hazards such as liquefaction, particularly in areas with specific soil characteristics (Tampubolon et al., 2022). Balaroa Subdistrict in Palu City was among the areas most severely affected by the earthquake and liquefaction disaster that struck on September 28, 2018. The event resulted in substantial changes to the physical, social, and ecological conditions of the environment. The liquefaction phenomenon caused the soil to lose its stability, leading to the subsidence and burial of residential areas under displaced soil materials. Consequently, a considerable portion of the natural vegetation and cultivated plants was destroyed, including seed-producing plants belonging to the Phanerogamae group (Mahli et al., 2024).

Based on the conditions observed in the post-liquefaction area of Balaroa Subdistrict, a gap exists between the presence of naturally growing Phanerogamae species and the availability of scientific information and educational resources that utilize this local biological potential. To date, no study has specifically documented the diversity of Phanerogamae species in the post-liquefaction area of Balaroa, resulting in limited information regarding their morphological characteristics and adaptive capacity in extreme environmental conditions (Hartono et al., 2020). The presence of Phanerogamae species following a disaster plays a crucial role in ecological rehabilitation processes by maintaining soil stability, increasing vegetation cover, and serving as indicators of environmental recovery (Arfah et al., 2021). Phanerogamae are considered the most evolutionarily advanced group of plants because they reproduce through seeds. Ontogenetically, seeds function as generative reproductive structures, as their formation is preceded by sexual reproduction (Wahyuni, 2023). The embryos of seed plants are bipolar, possessing both shoot and root poles. The shoot pole develops into stems, branches, and leaves, whereas the root pole develops into a root system that supports water and nutrient uptake as well as plant anchorage (Simanungkalit et al., 2024).

In reality, the Balaroa area has undergone significant changes in landforms and vegetation patterns as a result of the liquefaction disaster. However, to date, there is still a lack of formally documented data concerning the Phanerogamae species that are capable of growing and adapting to post-disaster environmental conditions (Hutagalung & Tarigan, 2019). Ideally, comprehensive scientific information regarding the morphological characteristics of Phanerogamae species in post-liquefaction areas should be available, along with local environment-based learning resources that can help students understand biodiversity concepts in a more tangible and relevant context. This gap requires immediate attention because the limited utilization of the surrounding environment as a learning resource may result in biology instruction that is less contextual and insufficiently connected to the ecological realities experienced by students in their daily lives (Amiruddin & Lumbaa, 2024). This study aimed to identify and describe the morphological characteristics of Phanerogamae plants in the post-liquefaction area of Balaroa Subdistrict, Palu City.

MATERIALS AND METHODS

Study area

This study was conducted in April 2026 in the post-liquefaction area of Balaroa Subdistrict, Palu City (Figure 1). The earthquake that struck Palu City on September 28, 2018, with a magnitude of 7.8 Mw, was followed by a tsunami and widespread liquefaction, resulting in extensive damage throughout the city and its surrounding areas. Among the most severely affected locations were Petobo and Balaroa, which experienced significant liquefaction impacts. The affected areas covered approximately 1.628 km² in Petobo and 0.422 km² in Balaroa, respectively. These catastrophic events caused substantial alterations to the physical landscape and environmental conditions, making the area an important site for studying vegetation recovery and plant adaptation in post-disaster ecosystems.

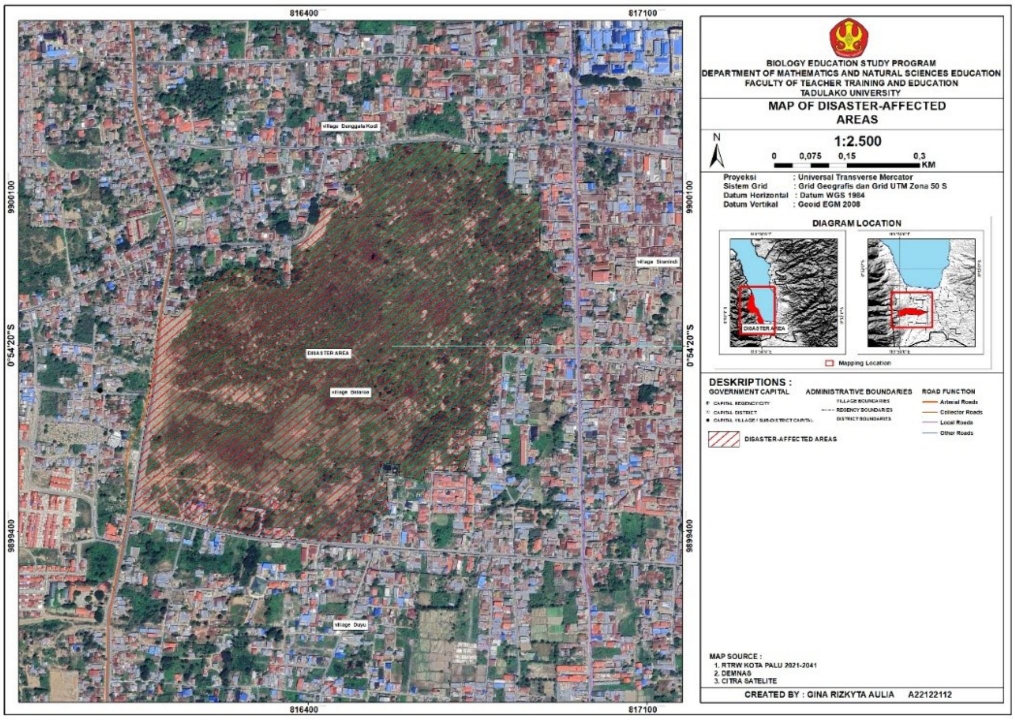

Figure 1. Map of the research location in the post-liquefaction area of Balaroa Subdistrict (Source: ArcGIS, 2026).

Materials

Procedures

Determination of Study Site and Observation Objects

The study site was selected using a purposive sampling approach. Locations were intentionally chosen based on the presence of Phanerogamae species growing in the post-liquefaction area of Balaroa Subdistrict, Palu City. Preliminary field observations were conducted to identify areas representing the post-disaster environmental conditions and to determine suitable observation sites for the study.

Sampling Procedure

Sampling was carried out through a series of activities, including field observation, documentation, and species identification. Direct observations were conducted using a purposive sampling method to record the Phanerogamae species growing in the post-liquefaction area of Balaroa Subdistrict. During the survey, each encountered plant species was documented by photographing its vegetative and generative structures. The collected documentation was subsequently used as the basis for morphological identification of the recorded species.

Identification of Phanerogamae Species

The documented Phanerogamae specimens were identified based on their morphological characteristics, including root, stem, leaf, flower, fruit, and seed features. Species identification was conducted using the *Botany of Higher Plants Guidebook* as the primary taxonomic reference. Identification was performed from the kingdom level down to the species level whenever possible. All identification processes were carried out at the Laboratory of the Biology Education Study Program, Faculty of Teacher Training and Education, Tadulako University.

Data analysis

Data were analyzed using a descriptive qualitative approach to characterize the Phanerogamae species identified in the post-liquefaction area of Balaroa Subdistrict. The data were obtained through field observations, photographic documentation, and plant identification based on morphological characteristics, including roots, stems, leaves, flowers, fruits, and seeds. The analysis was conducted in three stages: data reduction, data presentation, and conclusion drawing. Data reduction involved selecting, organizing, and classifying information relevant to the objectives of the study. Subsequently, the data were presented in the form of tables and detailed morphological descriptions to facilitate interpretation and understanding. The final stage consisted of drawing conclusions regarding the Phanerogamae species capable of growing and adapting to the post-liquefaction environment of Balaroa Subdistrict. This approach was chosen because it provides a comprehensive and realistic representation of plant conditions based on direct field observations.

RESULTS AND DISCUSSION

Results

Overview of the Study Area

Balaroa Subdistrict is one of the administrative areas located in West Palu District, Palu City, Central Sulawesi Province, Indonesia. This area was among the locations most severely affected by the earthquake and liquefaction disaster that occurred on September 28, 2018. The liquefaction event caused the soil to lose its bearing capacity, resulting in extensive damage to residential areas. Following the disaster, the Balaroa area underwent substantial landscape transformation and was designated as a red zone unsuitable for reconstruction and permanent settlement. These conditions make Balaroa Subdistrict an appropriate location for investigating the diversity and characteristics of Phanerogamae species in a post-disaster environment.

Phanerogamae Species in the Post-Liquefaction Area

Field observations conducted using the purposive sampling method recorded a total of 22 Phanerogamae species in the post-liquefaction area of Balaroa Subdistrict, Palu City (Table 1 and Figure 2). The identified species represent various taxonomic groups and exhibit diverse morphological characteristics, reflecting their ability to survive and adapt to environmental conditions altered by the liquefaction disaster. The occurrence of these species indicates that ecological recovery processes have taken place in the area, allowing vegetation to re-establish and contribute to ecosystem stabilization. Detailed information on the identified Phanerogamae species is presented in Table 1.

Table 1. Phanerogamae Plant Species in the Post-Liquefaction Disaster Area of Balaroa Subdistrict.

No.	Species		Family	Order
	Indonesia Name	**Scientific name**		
Class: Magnoliopsida				
1.	Sambiloto	*Andrographis panniculata* (Burm.F.) Nees	Acntaceae	Lamiales
2.	Rumput knop	*Hyptis capitata* Jacq.	Lamiaceae	
3.	Tembelekan	*Lantana camara* L.	verbenaceae	
4.	Tapak dara	*Catharanthus roseus* (L). G. Don	Apocynaceae	Gentianales
5.	Mondokaki	*Tabernaemontana divaricate* L.		
6.	Widuri	*Calotrophis gigantea*		
7.	Sembung	*Blumea balsamifera* (L). Dc	Asteraceae	Asterales
8.	Beluntas	*Pluchea indica* L.		
9.	Songgolangit	*Tridax procumbens* L.		
10.	Petai cina	*Leucaena leucocephala* (Lam). de Wit	Fabaceae	Fabales
11.	Ketapang cina	*Senna alata*		
12.	Puteri malu	*Mimosa pudica* L.		
13.	Bidara	*Ziziphus mauritana*	Rhamnaceae	Rosales

No.	Species		Family	Order
	Indonesia Name	**Scientific name**		
14.	Awar awar	*Ficus septica* Burm. F	Moraceae	
15.	Jarak merah	*Jatropha gossypifolia*	Euphorbiaceae	Malpighiales
16.	Obah nasi	*Glochidion zeylanicum*	Phylantaceae	
17.	Sri kaya	*Annona squamosa* L	Annonaceae	Magnoliales
18.	Apel sodom	*Solanum incanum* L.	Solanaceae	Solanales
19.	Sidaguri	*Sida acuta* Burm.f.	Malvaceae	Malvales
20.	Anggur semak	*Causonis trifolia* L.	Vitaceae	Vitales
Class: Liliopsida				
21.	Ampet	*Typha angustifolia*	Typhaceae	Poales
22.	Telinga gajah	*Alocasia macrorhizos*	Araceae	Alismatales

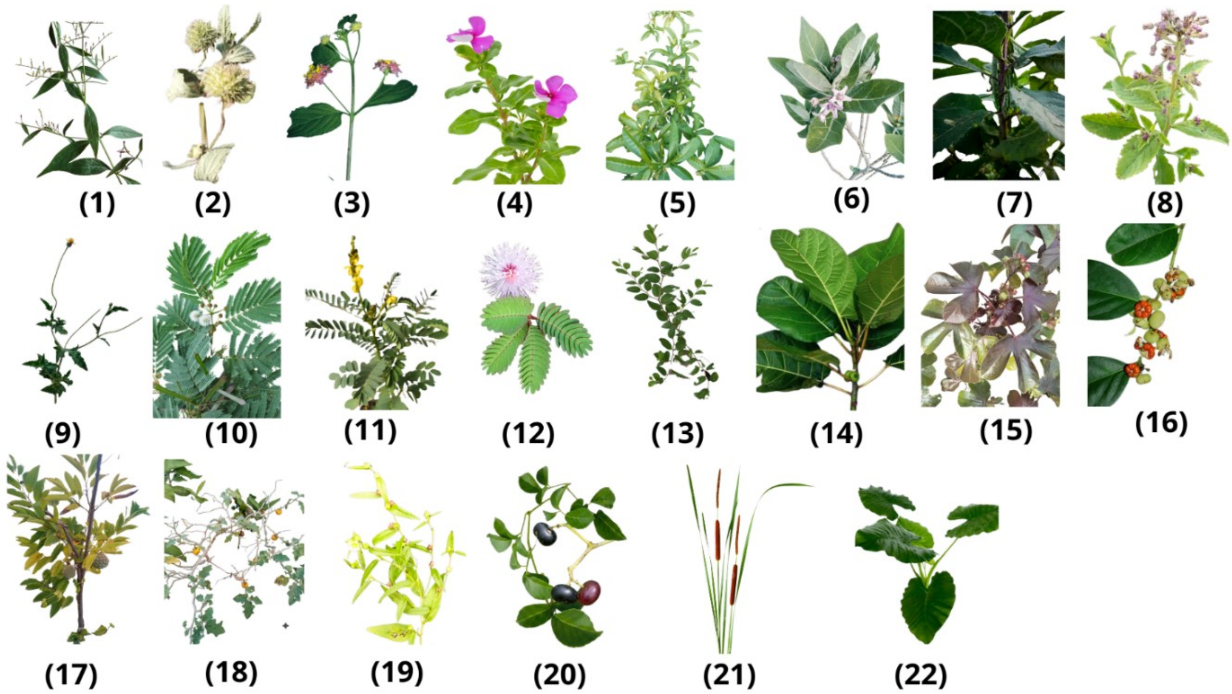

Figure 2. Several Phanerogamae species were found to be well established in the post-liquefaction area of Balaroa Subdistrict, Palu City. 1. *Andrographis panniculata,* 2. *Hyptis capitata,* 3. *Lantana camara* L, 4. *Catharanthus roseus* (L)., 5. *Tabernaemontana divaricata,* 6. *Calotropis gigantea*, 7. *Blumea balsamifera*, 8. *Pluchea indica,* 9. *Tridax procumbens,* 10. *Leucaena leucocephala*, 11. *Senna alata,* 12. *Mimosa pudica,* 13. *Ziziphus mauritana,* 14. *Ficus septica* Burm. 15. *Jatropha gossipyfolia,* 16. *Glochidion zeylanicum* 17. *Annona squamosa,* 18. *Solanum incanum* ,19. *Sida acuta,* 20. *Causonis trifolia,* 21. *Typha angustifolia,* 22. *Alocasia macrorrhizos*.

Discussion

The Phanerogamae species identified in the post-liquefaction area of Balaroa Subdistrict, Palu City, are presented in Figure 2 and Table 1. These figures provide visual documentation of each species recorded during field observations. The diversity of plant species observed indicates that, despite the severe environmental disturbances caused by the liquefaction disaster, various Phanerogamae species have successfully re-established and adapted to the altered post-disaster soil conditions. The study recorded a total of 22 Phanerogamae species in the post-liquefaction area of Balaroa Subdistrict, demonstrating the capacity of vegetation to recover and recolonize environments subjected to extreme disturbances caused by natural disasters. These findings are consistent with those reported by Hartono (2020), who stated that Phanerogamae species can be identified through morphological characteristics such as roots, stems, leaves, flowers, and fruits, which were also used as the primary identification criteria in the present study.

Similarly, Ulfa et al. (2023) reported that morphological variation serves as a fundamental basis for plant species identification in field studies. However, the present study differs from previous investigations in terms of both location and environmental conditions. Earlier studies were conducted in relatively stable environments, such as university campuses, whereas this research was carried out in a post-liquefaction landscape where soil structure and environmental conditions had been substantially altered by the disaster. As a result, the species recorded in Balaroa tended to be those with high adaptive capacities to extreme environmental conditions, including *Andrographis paniculata*, *Lantana camara*, and *Mimosa pudica*. From an ecological perspective, this pattern is consistent with the theory of ecological succession, which suggests that pioneer species are often the first to colonize and establish in disturbed habitats because of their rapid growth, high reproductive potential, and strong tolerance to environmental stress (Wiwin & Nuraedah, 2022).

Observations conducted in the post-liquefaction area of Balaroa Subdistrict revealed that not all Phanerogamae species were capable of surviving and adapting to the post-disaster environmental conditions. Field identification recorded only 22 Phanerogamae species distributed across two classes, namely Magnoliopsida and Liliopsida, and 12 orders, with herbaceous plants, shrubs, and a few woody species being the dominant growth forms. Among the species identified were *Catharanthus roseus* (L.) G. Don, *Blumea balsamifera* (L.) DC., *Lantana camara* L., *Pluchea indica* (L.) Less., *Tabernaemontana divaricata* (L.) R.Br. ex Roem. & Schult., *Calotropis gigantea* (L.) Dryand., *Mimosa pudica* L., *Jatropha gossypiifolia* L., *Typha angustifolia* L., and *Alocasia macrorrhizos* (L.) G. Don. The occurrence of these species suggests that only certain plants possess the adaptive capacity required to withstand environmental changes resulting from liquefaction, including alterations in soil structure, unstable land conditions, and limited nutrient availability. Variations in vegetation density were also observed among species. For example, *Lantana camara*, *Mimosa pudica*, and *Hyptis capitata* exhibited higher population densities and broader distributions than most other species. This pattern may be attributed to their pioneer characteristics, including rapid regeneration, high tolerance to environmental disturbances, and efficient reproductive strategies, enabling them to colonize and dominate post-disaster habitats more successfully than species with lower adaptive capacities (Negi et al., 2019).

Based on the taxonomic identification, three species were classified within the order Lamiales, namely *Andrographis paniculata*, *Hyptis capitata*, and *Lantana camara*. These species share several diagnostic characteristics typical of Lamiales, including opposite simple leaves, tubular flowers with bilateral (zygomorphic) symmetry, and quadrangular stems that are commonly observed in herbaceous members of the order. Despite these shared characteristics, differences were evident in their growth forms and fruit types. The findings of this study are consistent with the morphological descriptions reported by Group et al. (2016), which indicate that these species possess the distinctive characteristics of Lamiales and exhibit broad ecological adaptability across a wide range of environmental conditions.

Based on the identification results, three species belonging to the order Gentianales were recorded, namely *Catharanthus roseus* (L.) G. Don, *Calotropis gigantea* (L.) Dryand., and *Tabernaemontana divaricata* (L.) R. Br. ex Roem. & Schult., all of which are members of the family Apocynaceae. These species exhibited morphological characteristics consistent with the general features of Gentianales, including herbaceous or shrubby growth forms, stems containing milky latex, opposite simple leaves, sympetalous (gamopetalous) flowers, and follicular fruits commonly found among members of Apocynaceae. The findings are consistent with the APG IV classification system, which places Apocynaceae within the order Gentianales, as well as the morphological descriptions reported by Antonelli et al. (2021). These characteristics indicate that the identified species possess the diagnostic features of Gentianales and are capable of adapting to a wide range of environmental conditions, including those found in post-liquefaction landscapes.

The identification process also revealed three species belonging to the order Asterales, namely *Blumea balsamifera* (L.) DC., *Pluchea indica* (L.) Less., and *Tridax procumbens* L., all of which belong to the family Asteraceae. These species exhibited morphological traits characteristic of Asteraceae, including herbaceous or shrubby habits, simple leaves, composite inflorescences arranged in capitula (flower heads) consisting of numerous florets, and achene-type fruits (cypselae) generally equipped with a pappus that facilitates wind dispersal. These observations are in agreement with the classification and morphological descriptions reported by Olivia et al. (2025), which emphasize the high adaptive capacity of Asterales species. Such adaptability enables members of this order to thrive in open habitats and disturbed environments, including post-liquefaction areas.

Furthermore, three species were identified within the order Fabales, namely *Leucaena leucocephala* (Lam.) de Wit, *Senna alata* (L.) Roxb., and *Mimosa pudica* L., all belonging to the family Fabaceae. These species displayed morphological characteristics typical of Fabaceae, including herbaceous, shrubby, or small tree growth forms, pinnately compound leaves, legume-type fruits, and root systems commonly associated with nitrogen-fixing symbiotic bacteria of the genus *Rhizobium*. These traits contribute to the ability of Fabales species to colonize open and disturbed habitats, including post-liquefaction environments. Their capacity to improve soil fertility through biological nitrogen fixation further supports their ecological role in vegetation succession and ecosystem recovery processes (Simanungkalit et al., 2024).

Based on the identification results, two species belonging to the order Rosales were recorded, namely *Ziziphus mauritiana* Lam. from the family Rhamnaceae and *Ficus septica* Burm.f. from the family Moraceae. Both species exhibited characteristics typical of Rosales, including woody tree or shrub growth forms, simple leaves, and fleshy or accessory fruits. Distinctive differences were observed between the two families. Members of Rhamnaceae are characterized by prominently three-veined leaves and drupe-type fruits, whereas Moraceae species are distinguished by the presence of milky latex and syconium-type accessory fruits. These characteristics are consistent with the APG IV classification system (2016), which places both Rhamnaceae and Moraceae within the order Rosales, and demonstrate the ability of these species to adapt to a wide range of environmental conditions, including disturbed habitats (Istomo & Utami, 2022).

Jatropha gossypiifolia L. was identified as a member of the order Malpighiales and the family Euphorbiaceae. This species is a shrub characterized by branched stems containing milky latex, palmately lobed leaves with three to five lobes, and small flowers arranged in compound inflorescences. Its fruit is a capsule that dehisces upon maturity, releasing dark brown to black seeds. These features correspond to the diagnostic characteristics of Euphorbiaceae, including latex-producing tissues, unisexual flowers, and capsule-type fruits that facilitate seed dispersal. In the present study, *Jatropha gossypiifolia* exhibited relatively high vegetation density within the post-liquefaction area, indicating a strong capacity to establish and persist in disturbed habitats. These observations are consistent with previous studies describing Euphorbiaceae as a family within Malpighiales whose members commonly occur as herbs, shrubs, or small trees characterized by latex production and capsule fruits (Wu et al., 2019).

Another species belonging to the order Malpighiales was *Glochidion zeylanicum* (Gaertn.) A. Juss., a member of the family Phyllanthaceae. This species displayed characteristics typical of the family, including a shrub or small tree growth form, woody stems, alternate simple leaves with elliptic to oblong shapes, small axillary flowers, and dehiscent capsule fruits. These traits are consistent with the morphological descriptions of Phyllanthaceae, whose members are generally characterized by simple leaves, small unisexual flowers, and capsule-type fruits. In this study, *Glochidion zeylanicum* demonstrated a notable ability to establish and survive within the post-liquefation environment, supporting previous reports by APG IV (2016) and Brahma and Baruah (2024) regarding its ecological adaptability.

Annona squamosa L. was identified as a representative of the order Magnoliales and the family Annonaceae. This species exhibited morphological characteristics consistent with the family, including a woody tree or shrub habit, alternate simple leaves, medium-sized flowers composed of free petals and sepals, and aggregate fruits formed from multiple carpels. In the present study, *A. squamosa* was characterized by oblong leaves, greenish-yellow flowers, and scaly aggregate fruits containing creamy-white edible pulp. These observations are in agreement with the morphological descriptions of Annonaceae reported by Anwar et al. (2025), confirming the taxonomic placement of the species within the order Magnoliales.

Solanum incanum L., commonly known as Sodom apple, was identified as a member of the order Solanales and the family Solanaceae. This species exhibits morphological characteristics typical of Solanaceae, including an herbaceous or shrubby growth habit, alternate simple leaves, sympetalous star-shaped flowers, five stamens, and berry-type fruits. In the present study, *S. incanum* was characterized by branched and spiny stems, coarse hairy leaves, bluish-purple flowers with conspicuous yellow stamens, and berries that change in color from green to yellow-orange upon maturation. These features are consistent with the diagnostic characteristics of Solanaceae within the order Solanales, whose members commonly possess actinomorphic flowers with fused petals and fruits in the form of berries or capsules. Such characteristics contribute to their ability to establish and persist in open habitats and disturbed environments (Reports, 2026).

Sida acuta Burm., commonly known as wireweed, belongs to the order Malvales and the family Malvaceae. This species displays morphological traits characteristic of Malvaceae, including an herbaceous or small shrub growth form, alternate simple leaves, stems commonly covered with trichomes, flowers with five conspicuous petals, and dry schizocarpic fruits that split into several mericarps at maturity. In this study, *S. acuta* exhibited finely pubescent branched stems, lanceolate leaves with serrated margins, small yellow flowers, and schizocarpic fruits. These observations are consistent with the morphological descriptions of Malvaceae, whose members are generally characterized by alternate leaves, bisexual flowers, and dry fruits, enabling them to thrive under a wide range of environmental conditions, including disturbed habitats (Pimple et al., 2024).

Causonis trifolia (L.) Mabb. & J. Wen was identified as a representative of the order Vitales and the family Vitaceae. This species possesses morphological characteristics typical of Vitaceae, including a climbing or scandent growth habit supported by tendrils, slender and flexible stems, alternate trifoliolate leaves, small greenish-yellow flowers, and berry-type fruits that turn dark purple to black when mature. These characteristics are consistent with the diagnostic features of Vitaceae, which are distinguished by the presence of tendrils used for climbing and fleshy berries as reproductive structures. The adaptability of *C. trifolia* to open and disturbed habitats, including post-liquefaction environments, reflects the ecological resilience commonly observed among members of the family Vitaceae (Liu et al., 2017).

Typha angustifolia L., commonly known as narrowleaf cattail, was identified as a member of the order Poales and the family Typhaceae. This species exhibits morphological characteristics typical of Typhaceae, including an aquatic herbaceous growth form, narrow linear leaves, erect stems, and an extensive rhizomatous root system that develops within muddy substrates. Its flowers are arranged in a cylindrical spike, with male flowers occupying the upper portion and female flowers located below. The fruits produce numerous small, hairy seeds that are readily dispersed by wind. These characteristics are consistent with the findings of Lv et al. (2024), who reported that members of Typhaceae are highly adapted to wetland environments. The occurrence of *T. angustifolia* in the study area reflects its ecological preference for waterlogged habitats and is consistent with the morphological characteristics commonly observed among monocotyledonous members of the order Poales.

Alocasia macrorrhizos (L.) G. Don, commonly known as giant taro or elephant ear, was identified as a representative of the order Alismatales and the family Araceae. This species displays morphological features characteristic of Araceae, including a monocotyledonous herbaceous habit, a pseudostem arising from an underground rhizome, large petiolate leaves with cordate to sagittate shapes, and a compound inflorescence consisting of a spadix enclosed by a spathe. Its fruits are small berries that turn red to orange when mature. These traits are typical of Araceae species within the order Alismatales, which are generally adapted to moist or aquatic habitats. In the present study, *A. macrorrhizos* was found at relatively high vegetation densities within the post-liquefaction area, particularly in swampy locations, indicating its strong adaptability to wet environmental conditions (Dwiana et al., 2025).

Overall, the present study documented 22 species of Phanerogamae belonging to two classes, Magnoliopsida and Liliopsida, distributed across twelve orders: Lamiales (3 species), Gentianales (3 species), Asterales (3 species), Fabales (3 species), Rosales (2 species), Malpighiales (2 species), Magnoliales (1 species), Solanales (1 species), Malvales (1 species), Vitales (1 species), Poales (1 species), and Alismatales (1 species). Several species exhibited relatively high vegetation densities and dominated particular areas of the study site. For instance, *Typha angustifolia* was primarily associated with waterlogged and muddy habitats, whereas *Alocasia macrorrhizos* was predominantly distributed in swampy areas. These distribution patterns correspond closely with the environmental conditions that developed following the liquefaction disaster, where certain parts of the landscape remain permanently moist or inundated due to damaged underground water infrastructure and persistent groundwater discharge. The continuous emergence of groundwater has created humid to wet microhabitats that favor the establishment of moisture-tolerant species. Consequently, these conditions have contributed to the formation of distinctive vegetation distribution patterns within the post-liquefaction landscape of Balaroa Subdistrict and highlight the important role of environmental factors in shaping plant community composition during ecological recovery.

CONCLUSIONS

Based on the results of this study, a total of 22 phanerogamae species were recorded in the post-liquefaction area of balaroa subdistrict, palu city. These species belong to two classes, namely magnoliopsida and liliopsida. The presence of these plants indicates that certain species possess a high capacity to adapt to post-disaster environmental conditions, particularly herbaceous plants and shrubs, which were found to dominate the study area. Variations in environmental conditions, ranging from dry and moist soils to permanently waterlogged habitats, influenced vegetation distribution patterns. Consequently, species such as *typha angustifolia* and *alocasia macrorrhizos* were more frequently encountered in swampy and muddy areas. Overall, the occurrence and distribution of phanerogamae species in balaroa subdistrict provide evidence of ongoing ecological recovery processes following the liquefaction disaster.

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