

Plant Diversity in Tanen Home Gardens, Kemuning, Ngargoyoso, Central Java, and Their Potential in *Keris* Culture

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ABSTRACT

The study was conducted in the home garden of Tanen hamlet in Ngargoyoso, Karanganyar, Central Java, Indonesia, which is situated at an elevation of 772 meters above sea level. The existence of Sukung Temple near Tanen with *Keris* reliefs shows *Keris* culture in this region since ancient times. This study aims to identify plant species in the Tanen home garden suitable for *Keris* culture and understand their potential roles in *Keris* culture. Sampling was carried out using the cruising method, following the village road. Data on the plants on-site were collected through surveys conducted in the home garden. The plant species were classified with the assistance of The Mountain Flora of Java and www.theplantlist.com. The plants found were determined to be related to the *Keris* culture. The data were qualitatively analyzed to determine the role of each plant species in *Keris* culture and quantitatively assessed using the species richness index. The home garden in Tanen comprises a variety of species, with a species richness of 26 belonging to 19 families. Herbs make up 38% of the plant habitus in Tanen's home garden, which also has shrubs (31%), trees (23%), and bushes (8%). The most commonly used plant organs are leaves (24%) and flowers (24%). The potency of plants in the Tanen home garden for *Keris* culture is: for the name of the plant called in the blade of the *Keris*; for *warangka* (sheath) and *deder* (hilt); for equipment in *Keris* making; for cleansing agents; for fragrances (fragrant agents); and offering (food ingredients, spices). The primary potential use of plants in Tanen's home garden is for offering.

Keywords: Home Garden, *Keris* Culture, Plant Diversity, Plant Potentials, Tanen

INTRODUCTION

Tanen is located in the Ngargoyoso area of Central Java, Indonesia. Sுகു Temple, situated near Tanen in Ngargoyoso, features reliefs that depict the *Keris* culture of the past. According to Handriyotopo and Simatupang (2017), *Keris* can be found in cultural objects on temple reliefs, and its origin can be determined based on these relics. The Prambanan, Penataran, Borobudur, and Sുകു temples had intricate carvings of swords and *Keris* from the 9th to 15th centuries AD. One of the sculptures at Sുകു Temple depicts a blacksmith workshop where the deity Bima is crafting a straight *Keris*. This relief indicates that the inhabitants of the Sുകു temple area, including Tanen, have longstanding *Keris* culture traditions. The *Keris* culture, primarily in Java, thrives today and has spread elsewhere.

There is a relationship between *Keris* culture and plants. There are many ways to see that plant elements are used in *Keris* culture. For example, certain plant-based woods are used to build the *Keris* elements (Bangunjiwa 2019). The *Keris* consists of many vital components, namely the *wilah* (blade) adorned with surface patterns known as *pamor*, the sheath, and the *hulu* (hilt), which are typically crafted from valuable materials, one of them is wood (Purwanto and Nurhamidah 2021). Besides that, presenting offerings made primarily of plant resources, such as fruits, flowers, and food items, is a traditional ritual when making *Keris*. Another cultural practice associated with *Keris* is *jamasan*, which involves preserving heritage objects, including *Keris* (Herminingrum and Majid, 2016; Priambadi and Nurcahyo, 2018). These diverse cultures utilize plants mainly to make offerings (Tubagus et al., 2020) during *jamasan* events. The study conducted by Sari et al. (2019) recorded a total of 97 plant species that are utilized for *jamasan* at *Kraton* Yogyakarta. Various plant-derived components are also used in the *jamasan* process. Another cultural practice associated with the *Keris* is *the kirab satu Sura* (Muharram) ceremony, carried out by the Mangkunegaran Temple and the Surakarta Palace.

The acquisition of plant materials in *Keris* culture primarily relied on the local environment, mainly privately owned property such as home gardens. This home garden is typically well-maintained in hilly or highland places with favorable climate and soil conditions. It is primarily used for growing various plants, particularly food crops commonly used in *sajen* (offerings) and *ubarampe* (ceremonial equipment) in *Keris* culture. Regional variations in plant utilization exist based on cultural contexts.

The Tanen home garden is situated at 772 meters above sea level. This altitude makes the Tanen area conducive for cultivating vegetables and fruits grown in that region. In Tanen, home gardens often consist of diverse plant species, particularly vegetables, chosen for their unique benefits and intended reasons for planting. The tendency to have gardens has been a longstanding practice among Tanen inhabitants. There are some benefits of home garden planting. Plant composition in the home garden can serve as a conservation approach to sustain plant diversity and its role within the garden (Guo et al., 2023). The study by Yinebeb et al. (2022) suggests that conservation plans consider the relationships between plant composition and cultural significance. Home gardening dates back to the transition of humans from a nomadic lifestyle to a passive one. Home gardens primarily ensure the consistent availability of fresh vegetables (Santos et al., 2022). The availability of fresh vegetables is crucial for maintaining a nutritious diet, as vegetables are rich in critical nutrients (Galhena et al., 2013; Korpelainen, 2023) that are necessary for meeting the immediate dietary requirements of rural people (Setiani et al., 2022). Home gardening is a longstanding and prevalent activity that is practiced globally. It has been crucial in family farming and local food systems for centuries. Home gardens provide nutritional benefits and promote traditional cultures, such as *Keris* culture (Rahmi and Gunawan, 2020; Pranditha et

al., 2021; Saroinsong et al., 2021). This study aims to discover the plant species in Tanen's home garden that are suitable for use in *Keris* culture and to determine the potential function of plants in Tanen's residential home garden.

METHODS

Study Area

The investigation was conducted in Tanen's residential home garden in Ngargoyoso, Karanganyar, Central Java. The research was conducted in Tanen's home gardens, focusing on cultivating plants in these gardens. According to Cunningham et al. (2022), the sampling procedure involved using the cruise method along the village road. Figure 1 displays the exploration route to invent plants in Tanen's home garden. It shows the cruising path in the Tanen area for sampling. The coordinates (111°6'40" E, 111°7'10" E) and (7°36'10" S, 7°35'50" S) reveal the location of the Tanen home garden.

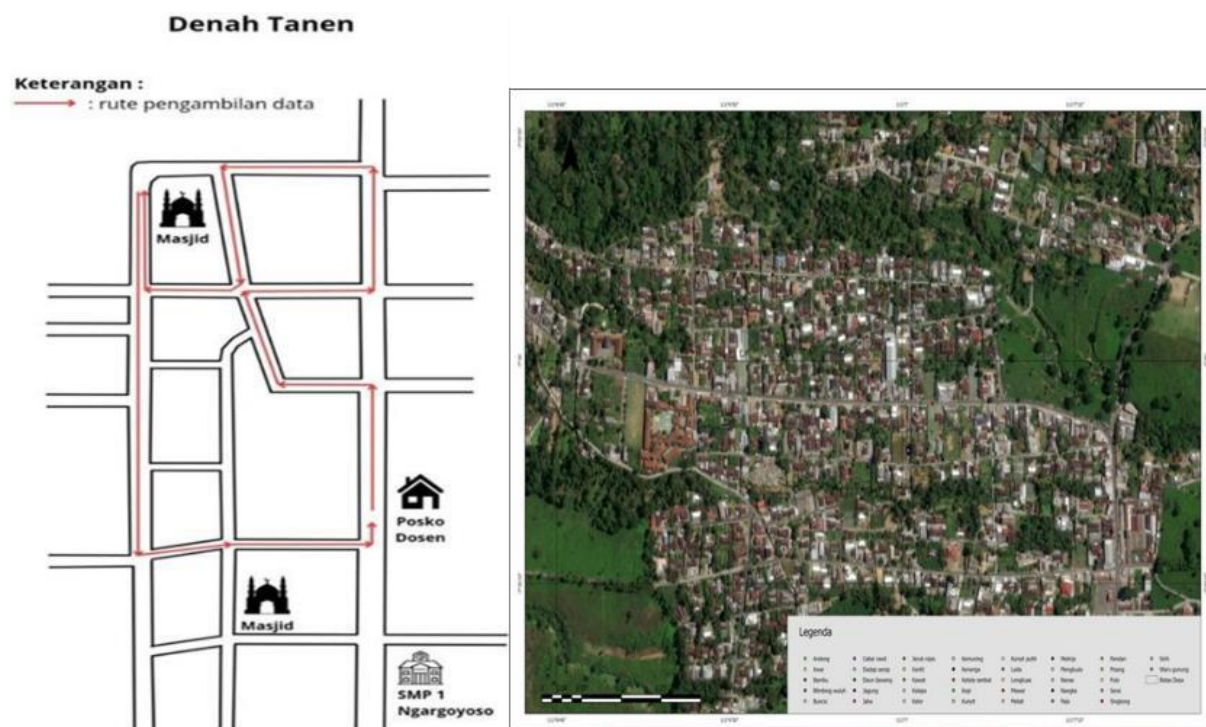


Figure 1. Tanen Home Garden

Data Collection

The documentation of plant species utilized in *Keris* culture was acquired through interviews (Júnior et al. 2016) with practitioners of *Keris* culture. Subsequently, a comprehensive literature review was conducted on a catalog of plants employed in *Keris* culture. The survey was carried out at Tanen's home garden using the cruising approach along the Hamlet Road, as seen in Figure 1. A home garden of 50 square meters was selected as a model. Plant identification was conducted in every home garden that satisfied the minimum area criteria for sampling. The data regarding the plant on the premises was acquired by a study conducted in the residential garden (Vogl and Puri 2004). The plants discovered were classified using the Mountain Flora of Java (Steenis et al., 2021) and

www.theplantlist.com. The plants discovered were identified as being associated with *Keris* culture by comparing them to previously conducted plant catalogs specific to *Keris* culture.

Data Analysis

The data were qualitatively examined by determining the specific role of each plant species within the *Keris* culture. Table 1 displays the data in more detail. The data was quantitatively analyzed using the species richness index, which is determined by counting the number of species seen in the home garden location.

RESULTS AND DISCUSSION

Plants have long been utilized in traditional societies for ages and remain integral to various cultures (Geng et al. 2017; Schaal 2019). The study has identified 26 plant species from 19 families that can be utilized in *Keris* production. For further information, please refer to Table 1. Zingiberaceae was the family with the highest number of members. The Zingiberaceae family has the most significant number of plant species, according to research by Trianingsih et al. (2023) on yard plants in Depok City. A study conducted by Iskandar et al. (2023) in a rural home garden in Sumedang revealed that the Zingiberaceae family has the highest number of species, with 11 medicinal plant species. Zingiberaceae is a botanical family with numerous ginger species, with extensive global applications as food and medicinal plants (Rad et al., 2017). The plants belonging to this botanical family yield sustenance, condiments, colorants, fragrances, and beauty products (Phumthum and Balslev, 2020). In *Keris* culture, species from the Zingiberaceae family were mainly utilized for culinary purposes, such as flavoring porridge, *ingkung* (grilled boiling chicken with coconut milk), and yarn production, among other applications. This meal was incorporated into *sajen* (offerings) during traditional ceremonies associated with *Keris* culture.

Table 1. List of plants in Tanen's home garden that are potentially used for *Keris* culture

Local name	Scientific name	Family	Role in <i>Keris</i> culture	Organ used
<i>Awar-awar</i> (Hauili fig)	<i>Ficus septica</i> Burm F.	Moraceae	Material for sheath or hilt	Stem
<i>Bawang merah</i> (Shallot)	<i>Allium cepa</i> L.	Liliaceae	Blade part name Spice for offering food	Tuber Tuber
<i>Cabe rawit</i> (Birds eye chili pepper)	<i>Capsicum frutescens</i> L.	Solanaceae	Spice for offering food	Fruit
<i>Jagung</i> (Corn)	<i>Zea mays</i> L.	Poaceae	<i>Pamor</i> name Offering material	Leaf Fruit
<i>Jahe</i> (Ginger)	<i>Zingiber officinale</i> Rosc.	Zingiberaceae	Spice for offering food	Rhizome
<i>Jeruk nipis</i> (Lime)	<i>Citrus aurantifolia</i> (Christm.) Swingle	Rutaceae	Cleanser	Fruit
<i>Kelapa</i> (Coconut)	<i>Cocos nucifera</i> L.	Arecacea	<i>Pamor</i> name Material for offering food Cleanser	Leaf Fruit Fruit
<i>Kelor</i> (Moringa)	<i>Moringa oleifera</i> Lam.	Moringaceae	Material for offering food	Leaf
<i>Kenanga</i> (Dwarf Ylang ylang)	<i>Cananga odorata</i> var. <i>fruticosa</i> (Craib) J. Sinclair	Annonaceae	<i>Pamor</i> name Offering material Fragrance material	Flower Flower Flower

<i>Kopi</i> (Coffee)	<i>Coffea</i> sp.	Rubiaceae	Pamor name	Flower
<i>Kunir putih</i> (White turmeric)	<i>Curcuma zedoaria</i> (Berg.) Roscoe	Zingiberaceae	Spice for offering food	Rhizome
<i>Kunyit</i> (Turmeric)	<i>Curcuma longa</i> L.	Zingiberaceae	Spice for offering food	Rhizome
<i>Lengkuas</i> (Galangal)	<i>Alpinia galanga</i> L.	Zingiberaceae	Spice for offering food	Rhizome
<i>Mawar</i> (Rose)	<i>Rosa</i> sp.	Rosaceae	Offering material Fragrance material	Flower Flower
<i>Melati</i> (Jasmine)	<i>Jasminum</i> sp.	Oleaceae	Offering material Fragrance material Pamor name	Flower Flower Flower
<i>Melinjo</i> (Gnemon tree)	<i>Gnetum gnemon</i> L.	Gnetaceae	Pamor name	Fruit
<i>Mengkudu</i> (Noni)	<i>Morinda citrifolia</i> L.	Rubiaceae	Cleanser	Fruit
<i>Nangka</i> (Jackfruit)	<i>Artocarpus heterophyllus</i> Lam.	Moraceae	Blacksmith equipment	Stem
<i>Pala</i> (Nutmeg)	<i>Myristica fragrans</i> Houttt.	Myristicaceae	Pamor name	Flower
<i>Pandan</i> (Screwpine)	<i>Pandanus amaryllifolius</i> Roxb.	Pandanaceae	Blade part name Pamor name Material for offering food	Leaf Leaf Leaf
<i>Pisang</i> (Banana)	<i>Musa</i> sp.	Musaceae	Offering material	Fruit
<i>Pule</i> (Devils tree)	<i>Alstonia scholaris</i> R. Br.	Apocynaceae	Material for sheath/hilt	Stem
<i>Serai</i> (Lemongrass)	<i>Cymbopogon citratus</i> (DC.) Stapf	Poaceae	Spice for offering food	Leaf
<i>Singkong</i> (Cassava)	<i>Manihot utilissima</i> Pohl.	Euphorbiaceae	Offering material	Tuber
<i>Sirih</i> (Betel)	<i>Piper Betle</i> L.	Piperaceae	Offering material Pamor name	Leaf Leaf
<i>Ubi jalar</i> (Sweet potato)	<i>Ipomoea batatas</i> (L.) Lam.	Convolvulaceae	Offering material	Tuber

Tanen's home garden consisted primarily of herbs (38%) and shrubs (31%). Figure 2 displays the proportion of each plant habitus in the Tanen home garden. Certain kinds of bushes play multiple roles in *Keris* culture, including being used as blade parts name, materials for sheaths or hilts, cleansing agents, fragrance materials, offering materials, and materials for providing food. Herbs are plants used in cultural traditions as ingredients in food or as equipment for offerings known as *ubarampe*. The *Keris* culture offers a variety of cuisine options, such as *jenang* (Javanese toffee), *ingkung* (grilled boiling chicken with coconut milk), veggies, and *tumpeng* (a dish of yellow rice served in a cone shape). In Javanese society, ceremonial components, particularly those associated with *Keris* culture, frequently incorporate offerings. The Javanese community designs and uses the offering to convey a specific philosophical meaning. This relatively unexplored aspect of biocultural variety has evolved throughout time within an intricate socio-ecological system (Stryamets et al., 2021).

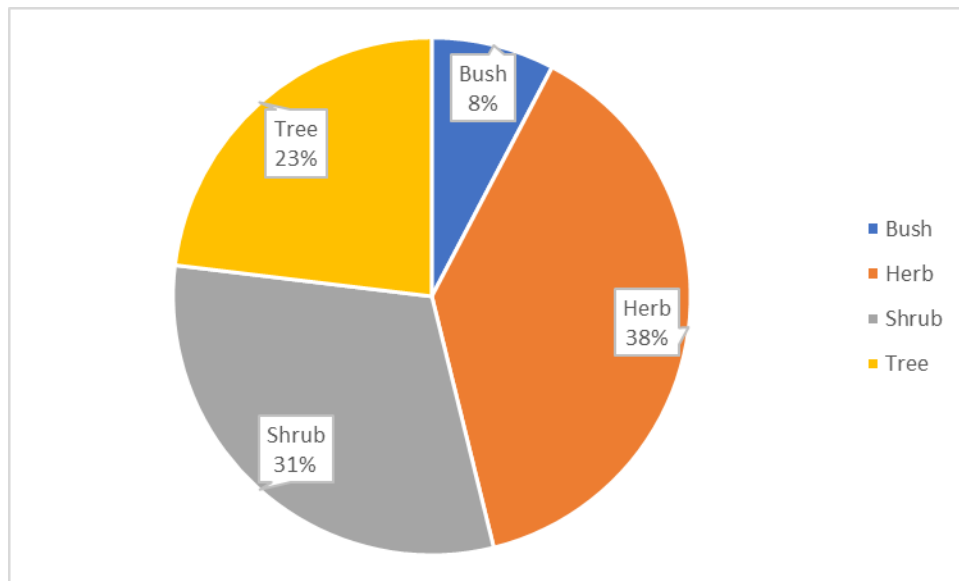


Figure 2. The percentage of plant habitus in Tanen's home garden that can be used in *Keris* culture

Different plant components, such as rhizomes, tubers, stems, leaves, flowers, and fruits were used in *Keris* culture. The flower was the predominant plant component (26%) utilized in *Keris* culture. Figure 3 provides a breakdown of the percentage of each plant part.

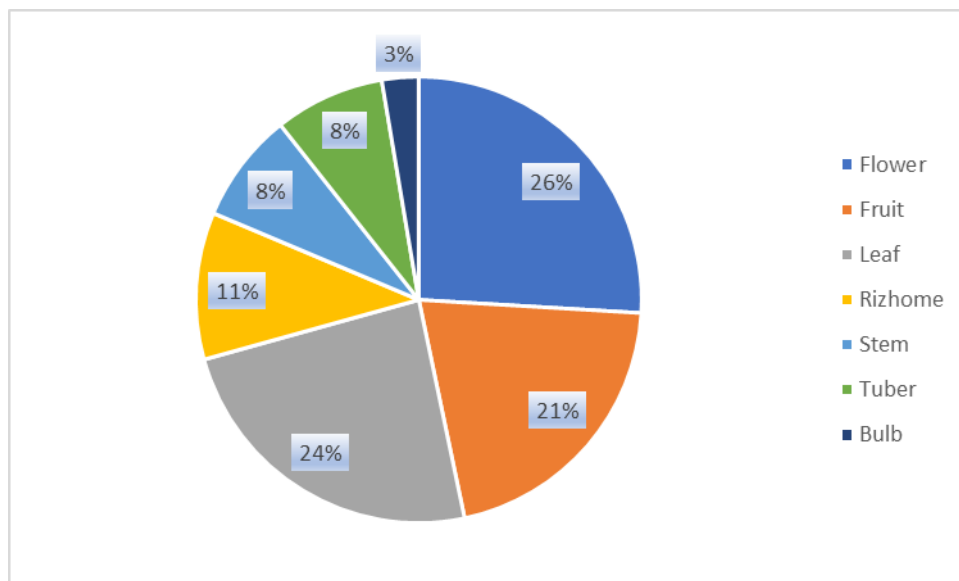


Figure 3. The percentage of plant parts present in Tanen's home garden that can be used in *Keris* culture

Tanen's home garden can provide materials for *ububan*, such as jackfruit wood. This wood was utilized as a wind tube instrument to heat iron. The stem wood from the jackfruit tree can be used to construct wind tube instruments that operate similarly to a pump. Another application is as a sacrificial substance, performed as an initial ritual or a concluding act. This presentation utilizes various plant parts as symbols, especially to convey a sense of anticipation. The *ubarampe* was a component specifically designed to be used to make offers. Approximately 47% of the plant species discovered in the Tanen home garden have the potential to serve as offers. This offering can be in the form of direct inclusion in the offering

material (21%) or as a spice (18%) and material (8%) incorporated into the preparation of offering foods. The plant was commonly identified by the name of the specific portion found on the blade of the *Keris*, such as pandan leaves, cornflowers, coconut leaves, *melinjo* seeds or flowers, betel leaves, and nutmeg flowers. *Pamor* refers to a design on the blade, with specific patterns that even incorporate the plant's name. *Ricikan* refers to the entirety of the blade, with certain portions also named after plants. The Tanen home garden plant has the potential to be used as a resource for crafting *warangka* (sheath) and *deder* (hilt) for the *Keris* blade. Tanen's home garden plants have two primary potentials for *Keris* care: cleansing and providing scent or fragrance ingredients. Figure 4 displays the proportion of all plants that have the potential to be used for *Keris* culture in Tanen's home garden.

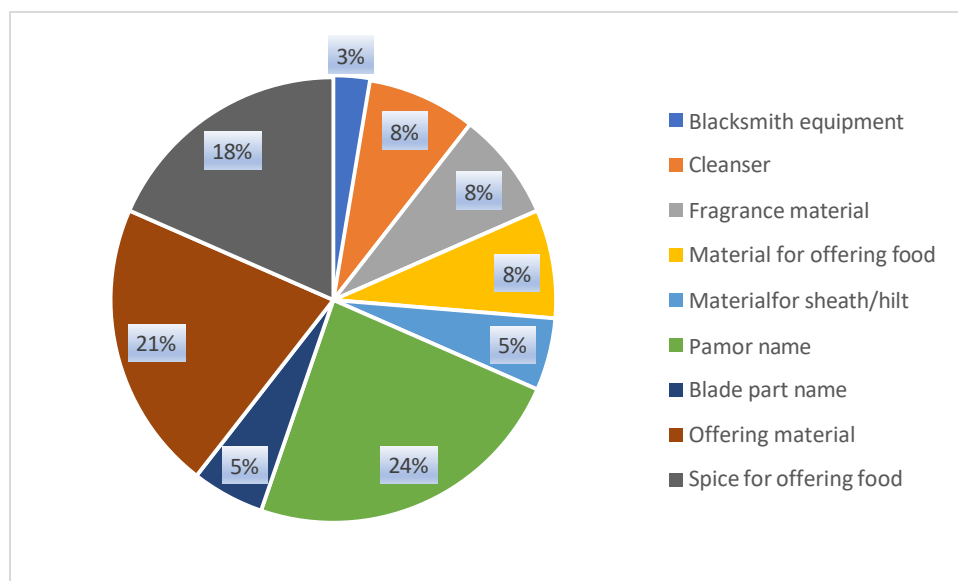


Figure 4. Percentage of plants potentially used for *Keris* culture in Tanen's home garden

The *Keris*'s blade is composed of metallic material (Mohamad et al., 2014; Purnawibawa, 2016; Musa et al., 2017). The blade featured *ricikan*, *pamor*, and *dhapur*, each with distinct botanical sources for terminology and design. The terminology of the blade segment is partially determined by referencing the plant's name. The term "Ricikan" is employed to describe objects that bear a resemblance to peanut flowers (*Arachis hypogaea*), such as the *kembang kacang* (nut flower). The term "bawang sabungkul" refers to the portion of a blade that has a shape resembling the bulb of a shallot (*Allium cepa*). Several *pamor* (pattern) names incorporate the botanical terms of pandan leaves, cornflowers, coconut leaves, *melinjo* seeds or flowers, jasmine flowers, betel leaves, and nutmeg flowers. The aesthetic appeal of the plant's components often leads to using the plant's name as the *pamor* of the *Keris*.

Warangka, also known as the sheath and *deder*, known as the hilt, are artisanal items crafted from plant wood. The plants used for *warangka* material discovered in Tanen's home garden include *awar awar* (*Ficus septica*) and *pule* (*Alstonia scholaris*). *Awar-awar* belongs to the *Ficus* genus. *Awar awar* wood, also known as Hauli fig wood, possesses aesthetically pleasing fibers, making it a desirable choice for crafting *warangka* (sheath) or *deder* (hilt). *Awar awar* is a crucial species in the tropical region, serving as a keystone resource (Peniwidiyanti et al., 2022). *Pule* wood, also known as Indian Pulai (Devil's tree), exhibits a comparatively gentle feel and a pristine hue. According to Javanese tradition, *awar-awar* wood is thought to have mystical abilities to ward off demons and negative energy (Bangunjiwa, 2019). According to specific Javanese individuals, *pule* wood is believed to

possess magical properties and positive energy. The utilization of plants for *warangka* materials is partially attributed to the inherent qualities of the wood. *Awar awar*, a wild plant, was discovered on the periphery of Tanen's garden. *Pule* is commonly found in the Tanen home garden as a decorative plant, but it also has the potential for *warangka*. Wood plants have been used for millennia in carving and craftsmanship due to their distinctive characteristics and adaptability. A recent publication in the Journal of Wood Science by Macchioni et al. (2022) highlights the significance of mechanical qualities, including hardness, density, and strength, in choosing a wood species for carving or craft purposes. A recent investigation by Ding et al. (2022) aimed to look into the ethnobotanical uses of the plants to make wooden bowls. The primary objective was to gain insights into the sustainability, cultural importance, and traditional wisdom associated with these practices. The study by Ding et al. (2022) recorded the utilization of 16 distinct plants in producing wooden bowls, with nine being employed as raw materials, three for dyeing, and four for varnishing. When choosing a wood species for carving or crafting, it is essential to consider its mechanical and chemical capabilities and the final product's intended aesthetic and functional attributes.

The plant found in Tanen's home garden that can be used to create *Keris* blades is the jackfruit (*Artocarpus heterophyllus*). Typically, jackfruit is explicitly cultivated for its fruit. However, jackfruit also yields wood that is suitable for crafting *Keris* equipment. The gadget fashioned from jackfruit wood is known as *Ububan*, and its purpose is to direct airflow towards the fire. Jackfruit wood is selected for its impermeability to air, which guarantees little air leakage from the gadget. Swami and Kalse (2019) studied the variation in the wood properties of jackfruit trees (*Artocarpus heterophyllus* Lam.) grown in Kerala's Thrissur district. The study determined that the jackfruit tree wood has a diffuse-porous structure, with aliform parenchyma surrounding individual vessels. These vessels sometimes form bands, arranging the rays in a broad to delicate pattern. Jackfruit wood has anatomical characteristics that closely resemble teak wood, yet it surpasses teak lumber in density and strength.

Tanen's plants utilized as cleansing agents included lime (*citrus*), coconut, and noni. Vong et al. (2018) have found that citrus possesses cleansing properties and acts as a corrosion inhibitor (Haldhar et al., 2019). *Morinda citrifolia*, or noni, is a compact perennial tree or shrub that reaches a height of 3 to 10 meters when fully grown (López and Yahia, 2011). According to a study by Kusumastuti et al. (2017), morinda is recognized for its capacity to reduce corrosion. While *Citrus aurantifolia* is frequently cultivated in gardens, *Morinda citrifolia* is not readily available in garden settings. People in Tanens are rarely cultivating Noni (*Morinda citrifolia*). This plant occasionally develops inadvertently, rather than deliberately, in the field. As a result of this circumstance, noni is seldom encountered or traded in conventional or alternative marketplaces.

Consequently, the utilization of noni for cleaning *Keris* blades is infrequent. The cleansing function of plants is typically attributed to the presence of surfactants. In recent years, plant-derived surfactants have garnered interest as an environmentally friendly substitute for synthetic surfactants in cleaning products. Rai et al. (2021) presented a review article that emphasizes the surfactant characteristics of saponins obtained from plants and their uses as cleaning agents. Saponins are a group of organic compounds that act as surfactants and are naturally present in many plant families, such as Agavaceae, Dioscoreaceae, and Liliaceae. When stirred in water, the plant-based surfactants are non-toxic, biodegradable, and create a soapy lather. They provide an environmentally benign option compared to synthetic surfactants, typically made from non-renewable resources and can harm the environment.

Tanen residents frequently cultivate roses in their home garden due to their exquisite blossoms. Tanen's home garden contains various rose color variations, including red, white, and pink. Red and white roses are frequently utilized in Javanese society, especially Tanen, as components of offerings, particularly within the *Keris* tradition. Furthermore, roses can serve as a viable source for producing fragrance oil for *Keris*. The *Rosa* genus is widely utilized in the perfume and scent sectors.

Moreover, it is used in the cosmetic and medicinal sectors owing to its properties that combat aging, depression, cancer, and microbiological activity (Özdemir and Budak, 2022). Jasmine (*Jasminum* sp.) was infrequently found in Tanen's home garden. This plant was commonly cultivated in gardens due to its aesthetic appeal and the aromatic scent of its blossoms. *Cananga odorata* var. *fruticosa*, widely known as dwarf ylang-ylang, was discovered in numerous residential gardens in Tanen. Several homeowners in Tanen cultivate dwarf-ylang-ylang plants in their gardens for commercial reasons. The flowers, particularly those with a faint yellowish hue, are available at the nearest conventional market. Rose, ylang-ylang, and jasmine are utilized in perfume production within the *Keris* culture. *Keris* perfume is often crafted using these flower ingredients via a distillation procedure. Plants emit perfumes by releasing volatile organic compounds (VOCs) unique to each flower (Mostafa et al., 2022). Humans have gathered aromatic plants for millennia to create valuable items with pleasant smells, such as perfumes, flavor enhancers, and insect repellents. *Cananga odorata* is an indigenous plant found in the Indonesian archipelago. The blossoms frequently extract essential oils with numerous applications and a unique aroma (Ramadhani and Salamah, 2021).

Cananga is extensively utilized for its essential oil, a crucial raw element in the fragrance business. The *Cananga* flowers are renowned in multiple parts of Indonesia for their use as a primary ingredient in producing essential oils and as decorative flower elements (Na'imah et al., 2024). Several phytochemical studies have successfully identified the components found in the essential oils of *Cananga odorata* (Tan et al., 2015). According to Chakira et al. (2022), numerous abiotic factors affect the chemical composition of the essential oils of *Cananga odorata*. Hence, it is imperative to investigate the phytochemistry of *Cananga odorata* in the Tanen area. Jasmine essential oil is a high-quality oil derived from the jasmine plant species, which is a collection of plants belonging to the Oleaceae family and initially found in Southeast Asia, particularly India and China. However, it is now cultivated globally. The flowers are extensively utilized in indigenous areas for traditional and religious events, where they are grown as decorative flora (Makeri and Salihu, 2023).

Many plants in Tanen are suitable for use as offerings. The investigation conducted by Sulistyawati et al. (2023) identified four plant species, including cananga (dwarf ylang-ylang), coconut, jasmine, and rose, that serve comparable purposes as *ubarampe* or offering. The function of the offering involves supplying raw materials (*ubarampe*) and ingredients and spices for the cuisine offered. A study by Swami and Kalse (2019) revealed that plants have a significant role in traditional rituals and offerings, and their utilization is frequently associated with cultural beliefs and practices. According to a recent study by Castagnetti et al. (2021), spiritual practices play a significant role in biocultural diversity. The study further emphasized prioritizing these practices in sustainable development initiatives that embody food sovereignty concepts. Geng et al. (2017) conducted a survey that revealed that the Naxi people have extensive knowledge about traditional ceremonial plants and various plants used in their ceremonies. *Ubarampe* was composed of bananas, sweet potatoes, betel, and tapioca. Spices such as bird eye chili pepper, shallots, galangal, ginger, screwpine, white turmeric, turmeric, nutmeg, and lemongrass are used to prepare various foods such as Javanese toffee,

yarn, *tumpeng*, and *ingkung* for the offering. The plants available for the offering primarily consist of vegetable and fruit plants.

CONCLUSION

Tanen's Home gardens consist of species (species richness= 26) belonging to 19 families. Their potential role in *Keris* culture is naming blade parts as sheath or hilt material for offering, fragrance, and cleanser agents. The most potential role of plants in the Tanen home garden is for offering in *Keris* culture.

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