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Short Communication

Ethnobotany of Plants for Cleansing and Fragrancing in Jamasan Keris Used by Surakarta Community, Central Java, Indonesia

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ABSTRACT
The Surakarta community practices the cultural tradition of caring for keris. This study documents traditional knowledge on plants used for cleansing and fragrance in keris care. Research was conducted from May to October 2023 through interviews, field observations, and literature reviews, with key informants selected purposively. Data were analysed thematically and quantitatively using the Relative Frequency of Citation (R.F.C.) index. Thirteen plant species, including *Cocos nucifera* L. and *Citrus aurantiifolia* (Christm.) Swingle, were essential for cleansing, while *Santalum album* L. was most recognized for fragrancing material. These findings highlight the importance of preserving ethnobotanical knowledge for cultural and plant sustainability.

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Ethnobotany, which examines the direct interactions between plants and humans (Jigme & Yangchen 2022), aligns with the biocultural perspective that studies the interconnectedness of people and their environments, including urban green spaces (Elands et al. 2019). Jigme and Yangchen (2022) showed the people of Kanglung have extensive indigenous knowledge of using 24 plant species in socio-religious activities. Andila et al. (2023) revealed that 70 plant species are integral to the Balinese traditional healing system. Ethnobotanical studies have been done in Surakarta, including edible plant species by Nurshillah et al. (2022), medicinal plants by Nurcahyo et al. (2024), and traditional rituals among Javanese by Mukarromah et al. (2024). However, studies on plants used for cleansing and fragrancing keris have never been conducted in Surakarta. This study holds ethnobotanical significance. Studying these plants reveals valuable local ethnobotanical knowledge, showcasing how communities utilise native flora for cleansing and aromatisation, thereby contributing to a greater appreciation of biodiversity and traditional ecological practices. Additionally, researching these plants serves educational purposes by integrating traditional practices with scientific principles, fostering understanding of cultural heritage and environmental stewardship among students, and promoting respect for local customs while emphasizing the importance of preserving traditional knowledge today. Studying plants for cleansing and fragrancing in Jamasan keris is significant in preserving traditional knowledge, plant diversity, and environmental health. Preserving this knowledge helps sustain local traditions and protect ethnobotanical resources. This study aims to fill the gap by documenting the Surakarta community's knowledge of plants used for Jamasan keris, focusing their roles in cleansing and fragrancing.

In Surakarta, the Jamasan tradition is practiced to cleanse keris from various impurities such as rust/corrosion, dust, and oil residue. Figure 1 shows a clean keris blade (A) and a corroded/dirt-covered blade (B), emphasizing the importance of regular maintenance by proper cleansing and fragrancing with local plant extracts to preserve the keris and its function.

Figure 1. Keris blades: (A) Without corrosion, (B) With corrosion and dirt.

This research was carried out in Surakarta from May to October 2023. Data were collected through interviews with key informants, field observations, and literature studies. Key informants were chosen using purposive sampling with the following steps: First, specific criteria for selection were established based on relevant knowledge and experience related to keris. The criteria for selection included having an extensive understanding of keris, skills in maintenance, experience as a practitioner, and being communicative. Next, potential types of specialised practitioners in keris who meet these criteria were identified with the help of keris community leaders or experts who

recruited some key informants by snowball technique. After securing consent, interviews were conducted to gather detailed insights, including bladesmiths (*empu*), sheath craftsmen (*mranggi*), keris caretakers, curators, and collectors. Key informants were recruited for their ability to provide detailed and authentic information on the ethnobotanical aspects of the Jamasan keris ritual, including the plants used and their preparation. The recruitment of key informants begins by meeting with the elders of the keris communities (Brotosuro, Brodjobuwono, Museum Keris Nusantara) to inform them of the recruitment objectives and the criteria needed. The elders of the keris communities gave recommendations for several names/individuals who met the criteria to become the first key informant and this continued the recruitment of this key informant from one key informant to another individual who met the criteria to become the next key informant. Interviews were conducted in semi-structured formats to allow guided inquiry and open-ended exploration of key informant's knowledge. Before the interview, key informants were briefed on its purpose and consented to participate. Using a validated questionnaire, one researcher asked questions while another recorded answers, focusing on plant selection, roles, and usage in the Jamasan keris ritual. Interviews were conducted one by one with key informants at different times and locations to ensure that there was no duplication of answers and ensuring key informant's comfort and willingness to share. The interview process continued until data saturation (in this case, 15 key informants) was reached (Kirchherr & Charles 2018). Field observations were conducted during the Jamasan keris ritual at the Museum Keris Nusantara on July 19, 2023, to gather contextual data and practical insights. A literature review was also performed using texts to enhance the data collected.

Data were recorded manually and organized by emerging themes. Plant information, including local names, uses, and parts, was recorded following by Jha (2018). A digital herbarium was created, and specimens were identified using online resources, which were also cross-referenced with World Flora Online (https://wfoplantlist.org), Plants of the World Online (https://powo.science.kew.org), and books by Partomoharjo (2014). The IUCN Red List 2022 was used to identify the conservation status of each plant.

Thematic analysis (Braun & Clarke 2006) was conducted to categorize plant uses, while the Relative Frequency of Citation (R.F.C.) Index (Tardío & Pardo-De-Santayana 2008) was used to quantify plant mentions, highlighting their cultural importance. R.F.C. index was used because it provides an overview of how often a plant species is mentioned or used by communities in a traditional context. It allows standardised comparisons, objectively documents knowledge distribution, and highlights culturally important species for conservation.

This research documented the plants used for cleansing and fragrancing Keris in Surakarta. The researchers conducted interviews, observations, and literature studies to get the plant names translated into English. They observed which plant parts were used and how they were applied in the Jamasan ritual. Plant samples were collected, digitised, and compared with online databases like Plants of the World Online and World Flora Online to determine scientific names. The study documented 13 species of plants belonging to 13 families used as materials for cleansing and fragrancing in Jamasan Keris. The diversity of plant species used for the Jamasan ritual reflects the Surakarta community's knowledge of using diverse flora for cleansing and fragrancing. This study found fewer species than Sari et al. (2019), documenting 97 species for all Jamasan processes, not just for cleansing in Keraton Yogyakarta. Understanding this plant diversity offers insight into their cultural and practical roles. Details of the plants are presented in Table 1. The choice of plants is essential to the Jamasan Keris ritual, reflecting the community's traditional knowledge. Understanding this plant diversity reveals their cultural and

practical roles. Details of the plants are provided in Table 1. This study also shows how the community uses different plant parts to care for the keris, emphasizing their close connection with nature and the importance of preserving this traditional knowledge.

Plants used to maintain keris blade are classified into two groups: cleansers (rust removers) and fragrances. Figure 2 shows some of the fruits used for cleaning keris blade. Cleaning plants often contain saponins, natural compounds with cleansing properties (Rai et al. 2021), eco-friendly, and low toxicity (Bezerra et al. 2023). Coconut (*Cocos nucifera*) and lime (*Citrus aurantifolia*) are frequently used. Besides cleansers, studies by Ayihaou et al. (2021) and Erawan et al. (2018) highlighted the cultural significance and diverse uses of coconut.

Plant parts are used in various ways to clean keris blades. Typically, fruits like *Averrhoa bilimbi*, *Citrus aurantifolia*, *Sapindus rarak*, *Ananas comosus*, and *Morinda citrifolia* are squeezed, and their juice is used to soak or wash the blade. *Cocos nucifera* water can be used directly by soaking the blade for several hours/days, depending on the level of corrosion.

Table 1. Plants and the specific role in Jamasan keris.

Local Name	Scientific Name	Application method	Plant part	Function/ action	R.F.C. (Cited/ 15)	IUCN
Blimbing wuluh /blimˈbɪŋ wuˈluh/	*Averrhoa bilimbi* L.	Star fruit is squeezed for the extract to clean the keris blade.	Fruit	Cleanser	0.67	N.E.
Cendana /ʧɛnˈdana/	*Santalum album* L.	Stem-made oil is applied to keris blade.	Stem	Fragrance	0.93	VU
Gaharu /gaˈharu/	*Aquilaria moluccensis* Oken	Stem wood-made oil is applied to keris blade.	Stem	Fragrance	0.20	CR
Jeruk nipis / ʤəˈruk ˈnipɪs/	*Citrus aurantifolia* (Christm.) Swingle.	Citrus fruits are peeled off the skin and squeezed for liquid extract to whiten the prestige of the keris blade.	Fruit	Cleanser	0.80	NE
Kantil /kanˈtil/	*Magnolia* × *alba* (DC.) Figlar	Flowers-made oil is applied to the blades of the keris blade.	Flower	Fragrance	0.07	N.E.
Kelapa / kəˈlapa/	*Cocos nucifera* L	Fruit water to soak the keris blades and clean the rust on the keris blade.	Fruit	Cleanser	0.87	NE
Kemenyan / kəˈmɛɲan/	*Styrax benzoin* Dryand.	Frankincense sap is burned to fumigate keris blade.	Stem	Fragrance	0.07	NE
Kenanga / kəˈnaŋa/	*Cananga odorata* (Lam.) Hook.f. & Thomson	Flowers-made oil is applied on the keris blade.	Flower	Fragrance	0.27	LC
Lerak /ˈlɛrak/	*Sapindus rarak* D.C.	Lerak flesh fruit is soaked with water to clean the dirt on the keris blade.	Fruit	Cleanser	0.07	NE
Mawar / ˈmawar/	*Rosa damascena* Herrm.	Flowers-made oil is applied on the keris blade.	Flower	Fragrance	0.40	N.E.
Melati / məˈlati/	*Jasminum sambac* (L.) Aiton.	Flowers-made oil is applied on the keris blade.	Flower	Fragrance	0.80	N.E.
Nanas /ˈnanas/	*Ananas comosus* (L.) Merr.	Peeled fruit is squeezed for extract to clean the keris blade / remove rust on the keris blade.	Fruit	Cleanser	0.27	N.E.
Pace /ˈpaʧe/	*Morinda citrifolia* L.	The fruit extract is used to cleanse the keris blade	Fruit	Cleanser	0.60	NE

NE = Not Evaluated, LC = Least Concern, CR = Critically Endangered, VU = Vulnerable.

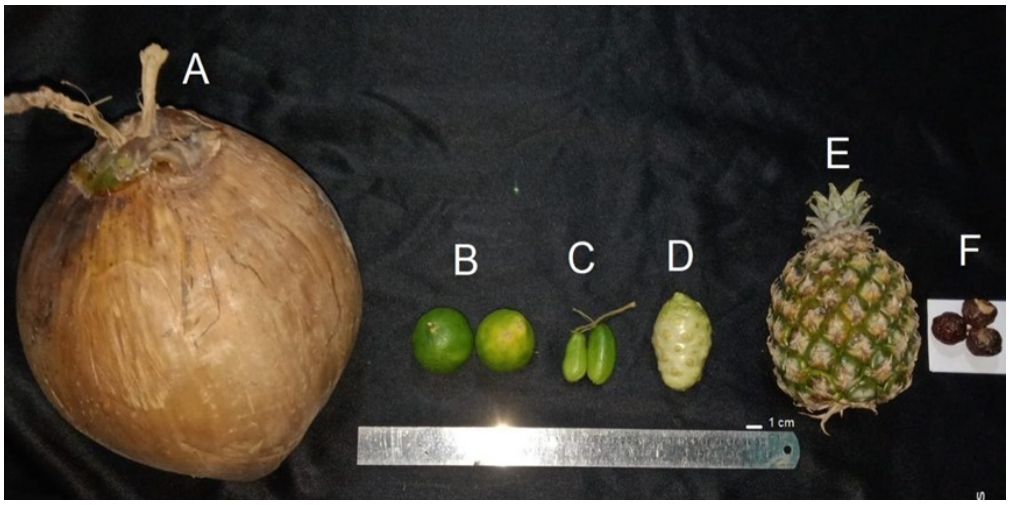

Figure 2. Fruits of some plants used for cleansing in jamasan keris: (A) Coconut, (B) Lime, (C) Bilimbi, (D) Noni, (E) Pineapple, (F) Soapnut/Lerak.

Several studies support that various plant extracts can act as natural corrosion inhibitors. Savitri et al. (2024) found that *Citrus aurantiifolia* peel, *Sapindus rarak*, and *Jasminum* extracts are effective corrosion inhibitors. Kusumastuti et al. (2017) demonstrated that *Morinda citrifolia* has corrosion-prevention properties, and Akrom (2024) found that *Ananas comosus* has corrosion resistance. *Sapindus rarak* has natural surfactant properties (Nurrosyidah et al. 2023).

This research shows that the Surakarta community has traditional knowledge of using plants for cleansing and fragrance. They care for keris by cleansing them of dirt and corrosion with various plant species. This traditional use of plants is environmentally friendly and helps reduce pollution compared to chemical cleansers.

Keris fragrance is traditionally made from plant flowers like *Magnolia alba*, *Cananga odorata*, *Rosa damascena*, and *Jasminum sambac* (see Figure 3). These plants are also central to Javanese traditional rituals (Mukarromah et al. 2024) and used by the Boyolangu community in East Java for their spiritual significance in traditional wedding ceremonies (Nursita et al. 2020). Three fragrant from the stem *Santalum album*, *Aquilaria moluccensis*, and *Styrax benzoin* resin are used (see Figure 4). Based on Celedon et al. (2016) *Santalum album* is renowned for its prized fragrance, and according to Debnath et al. (2024), the fumes of *Styrax benzoin* resemble a pleasant perfume, which is used in religious ceremonies in India.

This research has key implications for culture, conservation, and industry. It is crucial to maintain sustainable practices in using these plants within traditional practices while protecting their ecosystems by using plant-based, naturally derived materials as eco-friendly cleaners and fragrances. The traditional knowledge of local plants for cleansing and fragrancing with various application methods demonstrates local wisdom in the efficient and sustainable utilisation of natural resources. Using plants for cleansing and fragrancing significantly contributes to environmental conservation through eco-innovation. Moreover, this study offers the potential for developing new, safe, eco-friendly products while providing opportunities for sustainable business ventures.

Future research on cleansing and fragrance plants should focus on a few key areas. First, studying their chemical properties could reveal new potential uses and develop natural products. Second, it is important to check if these plants are being harvested sustainably. Last, studying the aromas could reveal their cultural meaning and health benefits, connecting tradition to modern wellness.

Figure 3. Flowers for fragrance materials (A) *Rosa damascena*, (B) *Magnolia alba*, (C) *Cananga odorata*, (D) *Jasminum sambac*.

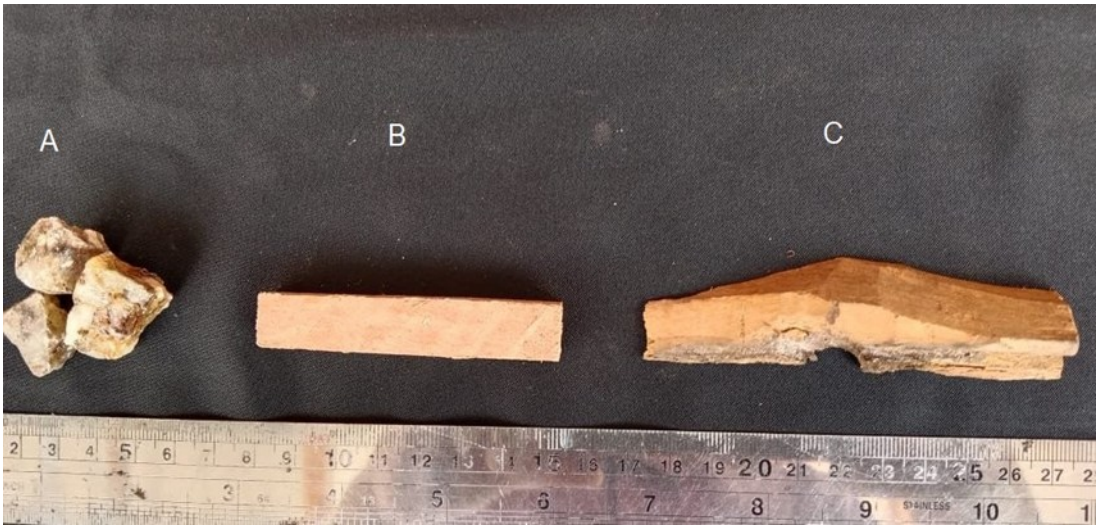

Figure 4. Wood and resin of plants for fragrance materials: (A) *Styrax benzoin*, (B) *Santalum album*, (C) *Aquilaria malaccensis*.

AUTHOR CONTRIBUTION

J.A. designed the research, chose key informants, collected data, and wrote the manuscript. S.G. designed the data concept. S.C. and S.D.M. searched for plant bioactivities data.

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CONFLICT OF INTEREST

The authors declare that there are no conflicts of interest regarding the publication of this article.

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