

Ethnobiology and symbolic roles of plants and animals in Javanese funeral rituals, Central Java, Indonesia

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Abstract. Pinasti LR, Iftitani MA, Malikasari, Muna MB, Zulfani SD, Indrawan M, Wahyuni T, Saensouk S, Setyawan AD. 2025. *Ethnobiology and symbolic roles of plants and animals in Javanese funeral rituals, Central Java, Indonesia*. Biodiversitas 26: 4805-4820. This study explores the ethnobotanical and ethnozoological dimensions of funeral and post-funeral traditions among the Javanese Muslim community in Kalibawang, Wonosobo District, Central Java, Indonesia. The research aimed to document the species of plants and animals used in ritual practices, their symbolic meanings, and their integration with Islamic and local cultural values. A descriptive-exploratory approach was employed, combining qualitative interviews with 90 respondents, field observations, and quantitative analysis using the Relative Frequency of Citation (RFC) index. The findings revealed 19 plant species and 4 animal species involved in various stages of the ritual process. Flowers and leaves were the most frequently used plant parts, particularly *Jasminum polyanthum*, *Magnolia × alba*, *Cananga odorata*, and *Oryza sativa*, which held the highest RFC values (0.67-0.87). Among animals, *Gallus domesticus* ranked highest (RFC 0.67), followed by *Bos indicus* and *Oreochromis* spp.. These species function as ritual mediators expressing purity, devotion, fertility, and gratitude. The integration of Islamic principles with Javanese cosmology forms a harmonious synthesis that sustains both spiritual and ecological values. Moreover, the continuous use and cultivation of ritual species in homegardens contribute to biodiversity conservation through cultural continuity. The study concludes that the Kalibawang funeral tradition represents a living model of biocultural sustainability, where religious belief, cultural identity, and environmental stewardship coexist in a dynamic equilibrium that strengthens community resilience and moral ecology.

Keywords: Biocultural sustainability, ethnobotany, funeral rituals, Javanese culture, symbolic plants

INTRODUCTION

Indonesia is home to more than 300 ethnic groups spread across its archipelago, including major groups such as Javanese, Sundanese, and Madurese, as well as minor groups like Dayak, Asmat, and Toraja, each possessing distinct languages, beliefs, and traditions that reflect the country's rich cultural diversity (Kurnia and Andini 2024). Culture, in essence, is closely linked to human intellect and creativity and is regarded as a legacy inseparable from human existence (Mahdayeni et al. 2019). Within these diverse cultural systems, traditional customs associated with the human life cycle—birth, marriage, and death—are passed down through generations as a manifestation of the deep connection between humans, nature, and spirituality (Wojtkowiak and Mathijssen 2022). In many of these ceremonies, plants and other natural materials are essential elements for expressing respect and spiritual symbolism (Febrianti et al. 2022).

One of the regions in Indonesia that still preserves such traditions is Wonosobo District, located in Central Java. Known for its scenic highland landscapes and fertile

volcanic soils, Wonosobo is equally notable for its strong cultural identity and local wisdom (Sulaiman et al. 2022). Among the many traditions maintained by its people is the funeral ritual, a complex cultural event encompassing both Islamic and indigenous Javanese elements. This ritual involves not only a series of physical acts of caring for the deceased but also a rich set of symbolic gestures rooted in the community's ethnobotanical and ethnobiological knowledge. In Javanese culture, plants and animals have long been intertwined with daily life—not merely as sources of food and materials but as integral components of spiritual expression and social harmony (Hisyam 2021). Since ancient times, humans have utilized natural resources for subsistence and ritual purposes, and such practices have evolved into systems that reflect both ecological adaptation and cosmological belief (Salmerón-Manzano et al. 2020). In traditional Indonesian contexts, these biological elements often transcend their material value to embody profound spiritual and ritual dimensions (Adinugraha et al. 2024).

The funeral tradition in Wonosobo exemplifies this integration of religion, culture, and ecology. The series of

processions is deeply rooted in local Javanese customs and influenced by Islamic teachings. In accordance with Islamic law, there are four essential obligations toward the deceased—washing, shrouding, praying, and burying (Nasution and Rosli 2021). The bathing of the body, performed by relatives of the same gender, symbolizes purification and final respect before the spirit departs for the afterlife. The water used for this ritual is often mixed with fragrant flowers such as jasmine (*Jasminum polyanthum*) and ylang-ylang (*Cananga odorata*), believed to purify the body and convey tranquility (Marliana 2023). The subsequent shrouding with a white cloth (*kafan*) represents purity, humility, and readiness to return to the Creator. During the prayer and burial process, these flowers are again employed as adornments on the coffin or sprinkled over the grave, serving as both aesthetic and spiritual offerings. Jasmine, in particular, is perceived to possess sanctifying properties that cleanse the soul and facilitate spiritual peace (Elyanawati et al. 2024).

Beyond plants, animals also play a central role in post-funeral traditions, especially in the *selamatan*—a communal feast held after burial. In these events, chickens (*Gallus domesticus*), goats (*Capra aegagrus hircus*), and cattle (*Bos indicus*) are often slaughtered and shared among attendees as ritual offerings symbolizing sincerity (*ikhlas*), strength, and communal solidarity. Such practices are not acts of sacrifice in the religious sense but rather expressions of gratitude and remembrance. The consumption of shared food reinforces social unity and serves as a moral bridge between the living and the deceased. In ethnobiological terms, animals in ritual contexts are seen as mediators between human and spiritual realms, reflecting the cyclical relationship between life, death, and sustenance (Morris 2020).

This research aims to examine in depth the use and symbolic meaning of plants and animals in various stages

of the funeral ritual and the broader death tradition practiced by the people of Kalibawang Sub-district, Wonosobo District. It seeks to provide comprehensive insights into the cultural, ecological, and spiritual values embedded in these practices. By documenting how natural elements are integrated into ceremonial life, this study contributes to understanding how traditional communities sustain their cultural heritage through the interplay of nature, spirituality, and social structure. The findings are expected to serve as a reference for preserving ancestral traditions and ensuring that such practices remain vital components of local identity and cultural continuity in the face of modernization.

MATERIALS AND METHODS

Study area

This research was conducted in Kalibawang Sub-district, one of the administrative regions of Wonosobo District, Central Java Province, Indonesia (Figure 1). Geographically, Wonosobo lies between 7°04'40" S and 109°43'19"–110°04'40" E, at an elevation of approximately 744 m above sea level. The region is part of the volcanic highlands of Central Java and is characterized by a humid tropical climate, moderate temperatures, and fertile Andosol soils derived from volcanic materials. These conditions support high agricultural productivity and the growth of diverse vegetation, including numerous species used in daily life and ritual practices (Sulaiman et al. 2022). The research focused on four villages within Kalibawang Sub-district: Dempel, Kalialang, Karangsambung, and Mergolangu. Each village represents distinct ecological and cultural characteristics.

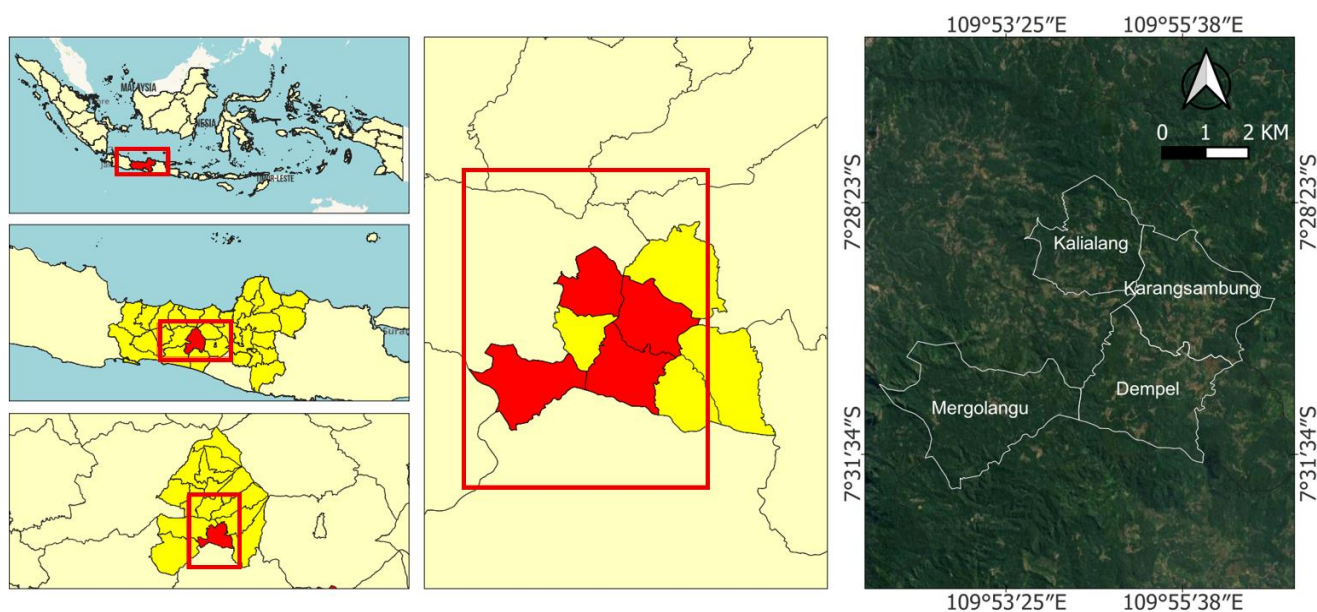


Figure 1. Map of the study area showing the four research villages—Dempel, Kalialang, Karangsambung, and Mergolangu—in Kalibawang Sub-district, Wonosobo District, Central Java, Indonesia

Dempel Village, located about 2 km from the sub-district office, is the most accessible area and exhibits relatively modern Islamic influences in its ritual practices. Kalialang Village, approximately 4.8 km away, and Karangsembung Village, about 1 km away, are situated in mid-elevation zones where traditional Javanese–Islamic customs remain actively practiced. The most remote site, Mergolangu Village, located around 7.2 km from the sub-district office, is characterized by a stronger adherence to ancestral traditions and forest-edge cultural practices associated with ancestral veneration.

The abiotic environment of these villages is dominated by volcanic hills and sloping terrain, with fertile soils that support homegardens, rice fields, and mixed-crop systems. The biotic environment includes diverse cultivated and wild species—such as *Musa paradisiaca*, *Oryza sativa*, *C. odorata*, and *J. polyanthum*—which are widely used in funeral and post-funeral ceremonies. The socio-cultural environment is primarily Javanese Muslim, where Islamic funeral obligations (washing, shrouding, praying, and burial) are integrated with local traditions involving plants and animals, reflecting both religious devotion and inherited cultural wisdom (Nasution and Rosli 2021; Adinugraha et al. 2024).

Fieldwork was conducted from 5 to 6 October 2024, following guidance from village leaders and elders who identified communities still practicing traditional funeral and *selamatan* rituals. Each research site was purposively selected to represent different ecological settings and levels of cultural preservation.

Research design and data collection

This study applied a descriptive–exploratory ethnobotanical and ethnozoological approaches that combined qualitative and quantitative methods to document and analyze the cultural use of plants and animals in funeral and post-funeral traditions. The qualitative component focused on recording local terminologies, symbolic meanings, and ritual sequences, while the quantitative aspect aimed to measure the frequency and importance of species used by the community. This mixed approach is widely adopted in ethnobiological studies to understand both the material and spiritual significance of biological resources in traditional societies (Febrianti et al. 2022; Adinugraha et al. 2024).

Data collection was carried out through semi-structured interviews and direct observations in four selected villages of Kalibawang Sub-district. A total of 90 respondents participated in this study, consisting of local elders, village officials, religious figures (*mudin*), and household representatives who had direct experience or knowledge of funeral rituals. The number of respondents was considered sufficient to represent community perspectives across gender and age groups. The interviews explored several key aspects: (i) the sequence of funeral and *selamatan* rituals, (ii) the plant and animal species involved in each stage, (iii) the parts of plants or animals used, (iv) methods of preparation and application and (v) the symbolic and spiritual meanings attached to their use.

Respondents were selected using a combination of randomized respondent collection (60%) and snowball

sampling (40%) techniques. The first method ensured the inclusion of diverse social backgrounds, while the second relied on recommendations from initial informants to identify individuals with deep cultural knowledge. This flexible sampling design allowed the researcher to reach both formal community leaders and traditional practitioners who may not hold official positions but possess rich oral traditions (Sulaiman et al. 2022).

In addition to interviews, direct observations were conducted during ritual events and community gatherings. The researcher observed the preparation of offerings, body bathing, shrouding, prayer ceremonies, and post-funeral *selamatan*, documenting the use of plants and animals in each stage. Data were recorded through photographic documentation and detailed field notes, including local names, contexts of use, and environmental sources of species (homegardens, markets, or natural vegetation).

All research procedures adhered to ethical standards of ethnobiological fieldwork. Informed consent was obtained verbally from each respondent after explaining the study's objectives, ensuring voluntary participation and anonymity. The research also received approval from local authorities and community elders. Sensitive information related to sacred rituals or restricted knowledge was handled respectfully and not disclosed beyond the purpose of academic documentation, following the ethical guidelines recommended for cultural and biodiversity research in Indonesia (Hisyam 2021).

Data analysis

Data obtained from interviews and field observations were analyzed using both descriptive and quantitative approaches. The descriptive analysis was applied to interpret the structure of ritual stages, the symbolic meanings of plants and animals, and their functional roles within the cultural context of the funeral and post-funeral ceremonies. Qualitative data such as narratives, terminology, and local beliefs were categorized thematically to identify relationships between natural elements and cultural symbolism (Mahdayeni et al. 2019; Wojtkowiak and Mathijssen 2022).

The quantitative component of the analysis employed the Relative Frequency of Citation (RFC) index to determine the relative importance of each species mentioned by respondents. The RFC value was calculated following Mukhoyyaroh and Hakim (2020) using the equation:

$$RFC = \frac{FC}{N}$$

Where FC represents the number of respondents who mentioned the use of a particular species, and N denotes the total number of respondents interviewed. This index allows for a standardized comparison of cultural importance among species cited by different individuals or groups within the study area.

Four main indicators were analyzed for each species: (i) the part of the species used, (ii) the method of use during rituals, (iii) the number of respondents who recognized or cited each species, and (iv) the citation frequency (%),

representing the proportion of respondents who mentioned the species relative to the total sample size.

All data were tabulated and summarized to reflect patterns of species utilization and the intensity of cultural recognition, serving as the basis for subsequent interpretation in the discussion section.

RESULTS AND DISCUSSION

Socio-demographic characteristics of respondents

A total of 90 respondents were interviewed across four villages in Kalibawang Sub-district, namely Dempel, Kalialang, Karangsambung, and Mergolangu (Table 1). The composition of respondents was almost evenly distributed among the study sites, representing both men and women who were directly involved in or knowledgeable about local funeral and post-funeral traditions. Of the total respondents, 51.1% were male and 48.9% female, reflecting the balanced participation of both genders in ritual activities.

Respondents' age distribution ranged from 17 to over 70 years, categorized into four groups: 18.4% were aged 17-29 years, 26.1% were aged 30-49 years, 23.4% were aged 50-59 years, and 32.1% were aged 60 years and above. Older participants generally possessed more extensive ritual knowledge and acted as cultural custodians (*sesepuh* or *mudin*), while younger generations participated mainly in preparation and assistance during ritual events. This pattern illustrates the intergenerational transmission of local wisdom through active involvement in community practices.

Regarding educational background, the majority of respondents had completed primary and secondary school education, with 42.2% having elementary-level education, 37.8% having high school education, and only 11.1% holding higher education degrees. This distribution indicates that ritual knowledge in the study area is not determined by formal education but rather by cultural immersion and social experience.

The main occupation of respondents varied, including farmers (48.9%), housewives (22.2%), traders (12.2%), and others such as craftsmen and community leaders. The dominance of farmers is consistent with the agrarian nature of Wonosobo, where daily activities are closely tied to the natural environment, reinforcing people's dependence on and familiarity with plant and animal resources used in rituals (Sulaiman et al. 2022).

All respondents identified themselves as Muslim (100%), consistent with the religious demographics of the region (Nasution and Rosli 2021). However, the majority also acknowledged that the funeral and *selametan* traditions incorporate pre-Islamic Javanese elements, showing a strong syncretic relationship between Islamic teachings and ancestral customs. The social roles of respondents within the ritual process included *mudin* (religious guides), family elders, and general participants, demonstrating how religious and traditional leadership are intertwined in community life.

Diversity of plant species used in funeral rituals

A total of 19 plant species belonging to 19 families were recorded as being used in various stages of the funeral and post-funeral (*selametan*) ceremonies in the four study villages of Kalibawang Sub-district, Wonosobo District. These plants were utilized in both the corpse-handling rituals (bathing, shrouding, praying, and burial) and the post-funeral communal events (3rd-, 7th-, 40th-, 100th-, and 1000th-day *selametan*). The composition of species reflects a close link between ecological availability and ritual symbolism, where easily accessible homegarden plants and aromatic flowers dominate ritual preparations (Febrianti et al. 2022; Marlina 2023).

The dominant families included Magnoliaceae, Fabaceae, and Poaceae, represented by *Magnolia × alba* (white champaca or *bunga kantil*), *Arachis hypogaea* (peanut), and *O. sativa* (rice). These species are integral to traditional symbolism—*M. × alba* is believed to signify eternal remembrance and spiritual attachment; *A. hypogaea* represents fertility and sustenance; and *O. sativa* functions as a universal symbol of life and prosperity in Javanese cosmology. Fragrant flowers such as *J. polyanthum*, *C. odorata*, and *Rosa hybrida* were the most frequently used elements in corpse-bathing and grave-sprinkling rituals, symbolizing purity, devotion, and peace for the soul of the deceased (Elyanawati et al. 2024).

The plants identified in this study serve diverse ritual functions, ranging from cleansing and purification, adornment of burial spaces, to offerings in commemorative feasts. Their selection is largely guided by cultural beliefs and local availability, with many species simultaneously fulfilling economic and ecological roles in household gardens (Sulaiman et al. 2022). The detailed list of species, families, local names, plant parts used, methods of use, number of respondents, and their Relative Frequency of Citation (RFC) values are presented in Table 2.

Table 1. Socio-demographic characteristics of respondents in the four study villages of Kalibawang Sub-district, Wonosobo District, Central Java, Indonesia

Variable	Category	Number of respondents (n = 90)	Percentage (%)
Gender	Male	46	51.1
	Female	44	48.9
Age (years)	17-29	17	18.4
	30-49	24	26.1
	50-59	21	23.4
	≥60	28	32.1
Education	Elementary	38	42.2
	High school	34	37.8
	College	10	11.1
Occupation	Farmer	44	48.9
	Housewife	20	22.2
	Trader	11	12.2
	Others	15	16.7
Religion	Islam	90	100
Village	Dempel	23	25.5
	Kalialang	22	24.5
	Karangsambung	23	25.5
	Mergolangu	22	24.5
Role in ritual	<i>Mudin</i> , elder,	—	—
	family member, participant		

Table 2. Plant species used in funeral and post-funeral rituals in Kalibawang Sub-district, Wonosobo District, Central Java, Indonesia

Local name	Scientific name	Family	Part used	Method of use	FC	RFC	Remarks symbolic meaning
<i>Kantil</i>	<i>Magnolia × alba</i> (DC.) Figlar	Magnoliaceae	Flower	Sprinkled and placed on body	68	0.76	Symbol of eternal remembrance and purity
<i>Melati</i>	<i>Jasminum polyanthum</i> Franch.	Oleaceae	Flower	Mixed with bathing water and grave offerings	72	0.80	Symbol of purity and spiritual cleansing
<i>Kenanga</i>	<i>Cananga odorata</i> (Lam.) Hook. f. & Thomson	Annonaceae	Flower	Used in corpse bath and shroud decoration	60	0.67	Represents calmness and sincerity
<i>Mawar</i>	<i>Rosa hybrida</i> L.	Rosaceae	Flower	Mixed with <i>siraman jenazah</i> water and grave sprinkling	57	0.63	Associated with affection and farewell
<i>Pandan</i>	<i>Pandanus amaryllifolius</i> Roxb.	Pandanaceae	Leaf	Fragrant decoration in offerings	45	0.50	Symbol of freshness and harmony
<i>Pisang</i>	<i>Musa paradisiaca</i> L.	Musaceae	Fruit, leaf	Used in offering dishes (<i>selametan</i>)	43	0.48	Symbol of fertility and continuity of life
<i>Kelapa</i>	<i>Cocos nucifera</i> L.	Arecaceae	Fruit, water	Ingredient for ritual meals	41	0.46	Symbol of purity and endurance
<i>Kacang tanah</i>	<i>Arachis hypogaea</i> L.	Fabaceae	Seed	Cooked for offerings	37	0.41	Symbol of fertility and sustenance
<i>Beras</i>	<i>Oryza sativa</i> L.	Poaceae	Seed	Used in offerings and body purification	78	0.87	Symbol of life and prosperity
<i>Kelor</i>	<i>Moringa oleifera</i> Lam.	Moringaceae	Leaf	Used for corpse purification	54	0.60	Believed to ward off negative spirits
<i>Sirih</i>	<i>Piper betle</i> L.	Piperaceae	Leaf	Mixed with flowers in offerings	39	0.43	Symbol of sincerity and communication
<i>Daun suji</i>	<i>Dracaena angustifolia</i> (Roxb.) Lodd.	Asparagaceae	Leaf	Natural coloring for offerings	29	0.32	Represents renewal and beauty
<i>Jeruk purut</i>	<i>Citrus hystrix</i> DC.	Rutaceae	Leaf	Ingredient in body-bathing water	31	0.34	Symbol of purification
<i>Daun salam</i>	<i>Syzygium polyanthum</i> (Wight) Walpers	Myrtaceae	Leaf	Ingredient in <i>selametan</i> dishes	42	0.47	Symbol of blessing and protection
<i>Jahe</i>	<i>Zingiber officinale</i> Roscoe	Zingiberaceae	Rhizome	Ingredient for ritual food and drink	26	0.29	Symbol of warmth and vitality
<i>Lengkuas</i>	<i>Alpinia galanga</i> (L.) Willd.	Zingiberaceae	Rhizome	Ingredient for <i>selametan</i> cooking	33	0.37	Symbol of protection and strength
<i>Kunyit</i>	<i>Curcuma longa</i> L.	Zingiberaceae	Rhizome	Food ingredient in <i>selametan</i>	36	0.40	Symbol of prosperity and healing
<i>Bunga kamboja</i>	<i>Plumeria rubra</i> L.	Apocynaceae	Flower	Placed on graves	58	0.64	Symbol of farewell and eternal rest
<i>Daun pandan hutan</i>	<i>Pandanus tectorius</i> Parkinson ex Z	Pandanaceae	Leaf	Decorative and aromatic use	22	0.24	Symbol of natural purity

Note: FC: Number of respondents, RFC: Relative Frequency of Citation

The predominance of fragrant and edible species reflects how the community merges ecological familiarity with ritual symbolism. Plants used in the funeral context are valued not only for their sensory attributes—color, scent, and form—but also for their perceived spiritual efficacy in purifying, honoring, and guiding the deceased’s soul toward peace in the afterlife (Marliana 2023; Adinugraha et al. 2024).

Diversity of animal species used in funeral rituals

In addition to plants, four animal species belonging to three families were recorded as components of the funeral and post-funeral (*selamatan*) traditions practiced by the communities of Kalibawang Sub-district, Wonosobo District. These animals are primarily used during communal feasts organized after the burial ceremony, reflecting both material and symbolic dimensions of offering. The most frequently cited species included *G. domesticus* (*ayam kampung*), *B. indicus* (cattle), *Oreochromis mossambicus*, and *O. niloticus* (tilapia fish). Their use is associated with values of sincerity (*ikhlas*), strength, fertility, and communal solidarity, which are central themes in Javanese ritual cosmology (Morris 2020; Adinugraha et al. 2024).

During the *selamatan* rituals—held on the 3rd, 7th, 40th, 100th, and 1000th days after burial—the slaughtering and sharing of meat symbolize gratitude to God and reinforce the social cohesion among relatives and neighbors. *G. domesticus* is the most frequently offered species, often prepared as *ingkung ayam kampung*, a whole chicken dish symbolizing submission and sincerity before the Creator. Cattle are occasionally sacrificed during major commemorations (100th or 1000th day) to express prosperity and collective gratitude. Meanwhile, freshwater fish such as *Oreochromis* spp. are served in smaller gatherings, symbolizing fertility, renewal, and the continuity of life (Nasution and Rosli 2021). The four animal species and their ritual functions are summarized in Table 3.

The predominance of *G. domesticus* underscores its central role as both a ritual offering and a socio-symbolic medium linking the living and the deceased. The consumption of these animals during *selamatan* reinforces

community solidarity and expresses gratitude for the deceased’s peaceful transition to the afterlife. In this way, animal use within the Wonosobo funeral tradition not only fulfills nutritional and social functions but also embodies deep-rooted spiritual meanings that bridge religion, ecology, and culture (Morris 2020; Adinugraha et al. 2024).

Utilization patterns and plant parts used

The analysis of plant use revealed that different parts of the species recorded were utilized in various stages of the funeral and post-funeral rituals, depending on their symbolic and practical functions. The plant parts most frequently used were flowers (36%), leaves (28%), fruits (18%), rhizomes (12%), and other parts such as seeds and stems (6%) (Figure 2). These values indicate that flowers dominate ritual applications due to their aesthetic, aromatic, and spiritual attributes, particularly in the *siraman jenazah* (corpse bathing), *kafan* (shrouding), and *makam tabur bunga* (grave decoration) stages (Marliana 2023).

Flowers such as *J. polyanthum*, *C. odorata*, *R. hybrida*, and *M. × alba* are perceived as sacred elements representing purity, tranquility, and farewell. The fragrance of these flowers is believed to help guide the soul of the deceased and to purify the ritual atmosphere (Elyanawati et al. 2024). Meanwhile, leaves—particularly from *Pandanus amaryllifolius*, *Syzygium polyanthum*, and *Citrus hystrix*—are commonly used as natural fragrance or ingredients in ritual dishes, symbolizing freshness, protection, and the maintenance of harmony. Fruits and rhizomes, such as those of *M. paradisiaca*, *Cocos nucifera*, and *Curcuma longa*, serve dual roles: as offerings for *selamatan* meals and as emblems of fertility, sustenance, and renewal of life.

The predominance of flowers and leaves in the ritual composition also reflects the ecological characteristics of Wonosobo’s homegardens, where ornamental and aromatic plants are easily available and cultivated as part of everyday life (Sulaiman et al. 2022). This integration between domestic cultivation and ritual function demonstrates the interdependence of cultural practice and agro-biodiversity within the local community.

Table 3. Animal species used in funeral and post-funeral (*selamatan*) traditions in Kalibawang Sub-district, Wonosobo District, Central Java, Indonesia

Local name	Scientific name	Family	Part used	Method of use	FC	RFC	Remarks Symbolic meaning
<i>Ayam kampung</i>	<i>Gallus domesticus</i> L.	Phasianidae	Whole body	Slaughtered and served as <i>ingkung</i> dish during <i>selamatan</i>	60	0.67	Symbol of sincerity (<i>ikhlas</i>) and submission to God
<i>Sapi</i>	<i>Bos indicus</i> L.	Bovidae	Meat	Cooked for communal feasts in major post-funeral ceremonies	30	0.33	Symbol of strength and prosperity
<i>Ikan nila</i>	<i>Oreochromis niloticus</i> (L.)	Cichlidae	Whole body	Cooked and served in smaller <i>selamatan</i>	23	0.26	Symbol of fertility and continuity of life
<i>Ikan mujair</i>	<i>Oreochromis mossambicus</i> (Peters)	Cichlidae	Whole body	Prepared for ritual meals	27	0.30	Symbol of peace and spiritual renewal

Note: FC: Number of respondents, RFC: Relative Frequency of Citation

Ritual stages and associated species

The funeral and post-funeral traditions of the Javanese Muslim community in Kalibawang Sub-district consist of several ritual stages that combine Islamic obligations with ancestral cultural elements. Each stage involves the use of specific plant and animal species that serve both functional and symbolic purposes. These stages are: (i) body bathing (*siraman jenazah*), (ii) shrouding (*kafan*), (iii) funeral prayer (*sholat jenazah*), (iv) burial (*pemakaman*), and (v) post-funeral commemorations or *selamatan* (of *tahlilan*, *yasinan*). The sequence of these ritual stages and the associated biological resources are summarized in Figure 3.

During the body bathing stage, the corpse is cleansed with fresh water mixed with a combination of aromatic flowers such as *J. polyanthum*, *C. odorata*, and *M. × alba*. These flowers symbolize purification, serenity, and the release of the soul from worldly impurities. The use of *C. hystrix* leaves and *Moringa oleifera* leaves is believed to purify the body and repel negative spiritual forces. The act of bathing the corpse thus embodies both physical and metaphysical cleansing, marking the beginning of the soul's journey to the afterlife (Marliana 2023).

In the shrouding stage, the body is wrapped in a white cloth (*kafan*) accompanied by prayers and often perfumed with the same floral mixture used in the bathing process. The white cloth represents purity, humility, and the readiness to return to God, while the fragrance of the flowers is intended to bring peace and sanctity.

The funeral prayer (*sholat jenazah*) is led by the *mudin* or local religious leader. During this stage, flowers such as jasmine and champaca are placed near the body or coffin as offerings symbolizing respect and remembrance. Their presence reflects the community's belief that the fragrance of flowers helps convey prayers and blessings for the deceased (Ciptaningrum et al. 2022; Elyanawati et al. 2024).

The burial stage involves covering the grave with soil and then decorating it with mixed flowers (*bunga tabur*)—commonly jasmine, rose, and frangipani (*Plumeria rubra*). These flowers express affection, farewell, and eternal remembrance. Banana leaves (*M. paradisiaca*) are sometimes used to line offerings or as protective layers within the grave, representing fertility and the cycle of life and death. A similar practice is also found in Betawi Muslim burial traditions (Ciptaningrum et al. 2022).

Finally, the post-funeral stages, collectively referred to as *selamatan*, are conducted on the 3rd, 7th, 40th, 100th, and 1000th days after burial. These ceremonies involve communal prayers, recitations of the *Yasin* chapter, and the sharing of ritual meals prepared from a combination of plant and animal products. Rice (*O. sativa*), coconut (*C. nucifera*), banana (*M. paradisiaca*), and spices from *C. longa* and *Zingiber officinale* are essential components of ritual dishes. Animal offerings—particularly chicken (*G. domesticus*), fish (*Oreochromis* spp.), and occasionally cattle (*B. indicus*)—are served as expressions of gratitude and social solidarity (Morris 2020; Adinugraha et al. 2024). These offerings symbolize the continuity of life, the transfer of blessings (*pahala*) to the deceased, and the unity of the living community through shared devotion.

The use of natural elements at each stage of the ritual illustrates how biological materials are integrated into Javanese spiritual life, embodying values of purity, respect, balance, and interconnection between humans, nature, and the divine.

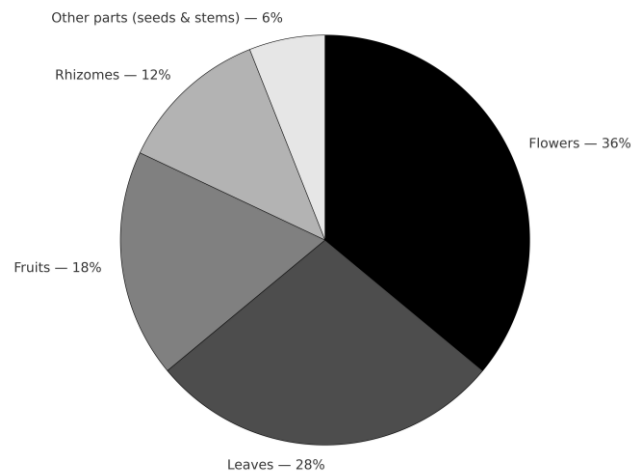


Figure 2. Percentage of plant parts used in funeral and post-funeral rituals in Kalibawang Sub-district, Wonosobo District, Central Java, Indonesia

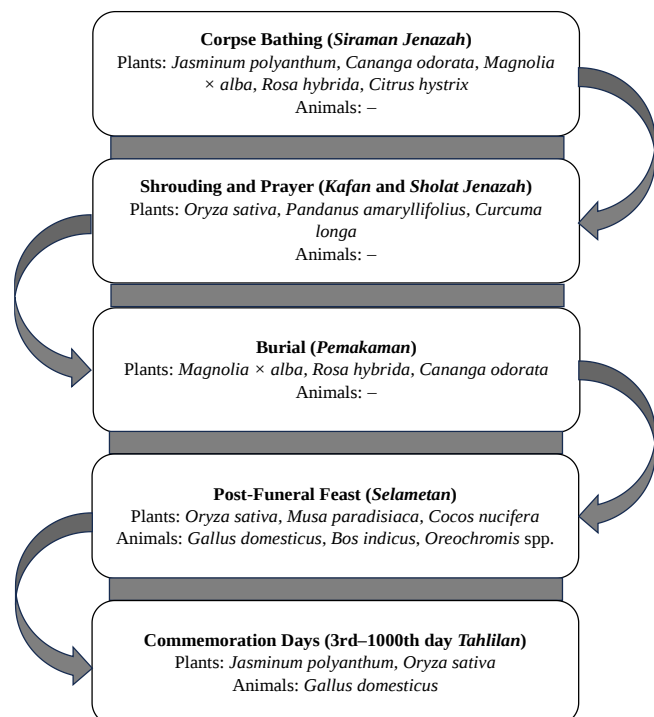


Figure 3. Sequence of funeral and post-funeral rituals in the Javanese community of Kalibawang Sub-district, Wonosobo District, showing associated plant and animal species used at each stage

Symbolic meanings of plants and animals in ritual contexts

The use of plants and animals in the funeral and post-funeral traditions of Kalibawang reflects the community's deep symbolic relationship with nature (Table 4). Every species involved in the ritual carries a cultural meaning that transcends its physical utility, representing the community's worldview that life, death, and nature are interconnected within a continuous spiritual cycle (Mahdayeni et al. 2019; Wojtkowiak and Mathijssen 2022).

Flowers are the most symbolically significant elements in these rituals. The white, fragrant blossoms of *J. polyanthum* (jasmine), *M. × alba* (white champaca), *C. odorata* (ylang-ylang), and *R. hybrida* (rose) embody purity, devotion, and eternal remembrance. Their color represents the cleansing of worldly sins, while their fragrance symbolizes prayers ascending to the divine realm. In Javanese cosmology, flowers are believed to mediate between the physical and spiritual worlds, serving as gentle offerings that bring tranquility to the soul of the deceased (Marliana 2023; Elyanawati et al. 2024).

Leaves from *P. amaryllifolius*, *C. hystrix*, and *S. polyanthum* signify protection, freshness, and the continuity of life. Their green color is associated with fertility, renewal, and hope for spiritual peace. Similarly, rhizomes such as *C. longa* (turmeric), *Z. officinale* (ginger), and *Alpinia galanga* (galangal) hold meanings of vitality, healing, and endurance, reinforcing the idea that life persists beyond physical death through moral and spiritual legacies. The use of rice (*O. sativa*) in almost every ritual feast underscores its role as a sacred staple representing life, abundance, and divine sustenance.

Fruit-bearing species, including *M. paradisiaca* (banana) and *C. nucifera* (coconut), are associated with fertility and the life cycle. The banana's prolific nature represents regeneration and continuation, while the coconut symbolizes purity and resilience—the essential attributes of a soul journeying toward the afterlife. Collectively, these

plants illustrate an intricate system of symbolism where each biological form mirrors a moral or spiritual virtue deeply rooted in local cosmology (Sulaiman et al. 2022; Adinugraha et al. 2024).

Likewise, animals used in *selamatan* rituals also carry profound symbolic meanings. The *ayam kampung* (*G. domesticus*) symbolizes sincerity (*ikhlas*) and humble devotion, reflecting the offering of oneself in submission to divine will. The slaughter of cattle (*B. indicus*) during major commemorations denotes strength, prosperity, and gratitude for collective blessings. Freshwater fishes (*Oreochromis niloticus* and *O. mossambicus*) are associated with fertility, peace, and spiritual continuity, embodying the hope for rebirth and sustenance for future generations (Morris 2020).

The integration of these symbolic meanings shows how local people interpret natural elements as spiritual mediators. Plants and animals are not merely materials used for ritual completeness; they represent a biocultural dialogue between humans and their environment—an ecological spirituality that preserves harmony between the living, the dead, and nature. This symbolic system also serves as a mechanism of cultural conservation, ensuring that local biodiversity remains closely tied to moral and spiritual identity. Thus, ethnobotanical and ethnozoological elements in the Wonosobo funeral tradition demonstrate a living expression of environmental ethics deeply embedded within Javanese philosophy.

Quantitative analysis: Relative Frequency of Citation (RFC)

Quantitative analysis using the Relative Frequency of Citation (RFC) index revealed distinct variations in the level of importance attributed to each species used in funeral and post-funeral rituals. The RFC values ranged from 0.24 to 0.87 for plant species and from 0.26 to 0.67 for animal species, indicating a broad spectrum of cultural recognition among respondents (Figure 4).

Table 4. Symbolic meanings of plants and animals used in funeral and post-funeral rituals in Kalibawang Sub-district, Wonosobo District, Central Java, Indonesia

Category	Species (Scientific name)	Part used	Symbolic meaning	Function in ritual
Flowering plants	<i>Jasminum polyanthum</i>	Flower	Purity, serenity, spiritual cleansing	Corpse bathing, grave decoration
	<i>Magnolia × alba</i>	Flower	Eternal remembrance, purity of soul	Corpse bathing, burial
	<i>Cananga odorata</i>	Flower	Tranquility, devotion, peace of spirit	Corpse bathing, post-burial
	<i>Rosa hybrida</i>	Flower	Love, farewell, sincerity	Grave decoration
Leafy plants	<i>Pandanus amaryllifolius</i>	Leaf	Protection, freshness, harmony	Corpse bathing, food fragrance
	<i>Citrus hystrix</i>	Leaf	Cleansing, fertility, renewal	Ritual purification
	<i>Syzygium polyanthum</i>	Leaf	Protection, moral purity	Cooking, <i>selamatan</i>
Rhizomatous plants	<i>Curcuma longa</i>	Rhizome	Vitality, healing, endurance	Ritual dishes
	<i>Zingiber officinale</i>	Rhizome	Energy, resilience	Food preparation
	<i>Alpinia galanga</i>	Rhizome	Protection, strength	Food offering
Staple and fruit plants	<i>Oryza sativa</i>	Grain	Life, abundance, divine sustenance	Core offering, <i>selamatan</i>
	<i>Musa paradisiaca</i>	Fruit	Fertility, regeneration	Ritual meal, decoration
	<i>Cocos nucifera</i>	Fruit	Purity, resilience, renewal	Food, offering
Animals	<i>Gallus domesticus</i>	Whole body	Sincerity, humility (<i>ikhlas</i>)	<i>Selamatan</i> , offering
	<i>Bos indicus</i>	Whole body	Strength, prosperity, gratitude	Major commemoration feast
	<i>Oreochromis</i> spp.	Whole body	Peace, fertility, continuity	Food for remembrance feast

Among plants, the highest RFC value was recorded for *O. sativa* (0.87), followed by *J. polyanthum* (0.80), *M. × alba* (0.76), and *C. odorata* (0.67). These species are among the most frequently cited by respondents and play a central role in multiple stages of the ritual process—from corpse bathing and shrouding to grave offerings and *selamatan* feasts. Their consistent use reflects not only symbolic significance but also their accessibility and economic value in the daily lives of local people (Febrianti et al. 2022; Marlina 2023).

Moderate RFC values (0.40–0.60) were observed for species such as *M. oleifera*, *S. polyanthum*, and *Piper betle*, indicating moderate but widespread use, particularly in purification and food preparation rituals. The lowest RFC values (<0.35) were associated with species that serve supplementary or decorative roles, including *Pandanus tectorius* and *Dracaena angustifolia*.

For animal species, *G. domesticus* (0.67) exhibited the highest RFC, confirming its dominant ritual function and social importance in the *selamatan* ceremonies. It is followed by *B. indicus* (0.33) and the freshwater fishes *O. mossambicus* (0.30) and *O. niloticus* (0.26). These results indicate that domesticated and readily available animals are preferred for ritual use, emphasizing practicality and cultural continuity in the community's commemorative practices (Morris 2020; Adinugraha et al. 2024).

The comparison of RFC values between plant and animal species demonstrates that plant-based materials dominate in terms of frequency and diversity of use, while animals are used in fewer but socially significant contexts. The overall pattern suggests that the cultural framework of Wonosobo's funeral rituals relies heavily on botanical diversity for ritual symbolism and sensory representation, whereas animals primarily embody values of devotion, strength, and collective gratitude.

Integration of Islamic and local Javanese values

The funeral and post-funeral traditions of the Kalibawang community illustrate a unique integration between Islamic principles and local Javanese cultural heritage (Table 5). Although the rituals are firmly rooted in Islamic teachings that emphasize purification, prayer, and remembrance of the deceased, the incorporation of local ethnobotanical and ethnozoological elements reflects the adaptive nature of Javanese spirituality. This syncretic process allows the community to uphold both religious orthodoxy and ancestral wisdom within a coherent cultural framework (Nasution and Rosli 2021; Adinugraha et al. 2024).

The four obligatory Islamic rites—body bathing, shrouding, praying, and burial—are performed strictly according to religious prescriptions. However, each of these stages is enriched by local symbolic expressions involving natural materials. The use of flowers, aromatic leaves, and sacred water during *siraman jenazah* (corpse bathing) demonstrates how the principle of *taharah* (spiritual and physical cleanliness) in Islam harmonizes with traditional Javanese aesthetics and reverence for nature. Similarly, the *selamatan* feasts held after the funeral reflect the Islamic concept of *sadaqah jariyah* (continuing charity), expressed through the communal sharing of food prepared from locally available plants and animals.

The coexistence of these elements exemplifies syncretic continuity—a process by which Islamic ritual structures are localized through cultural interpretation rather than replaced. The inclusion of Javanese symbols such as *bunga kanti* (*M. × alba*), *ingkung ayam kampung* (*G. domesticus*), and *beras tumpeng* (*O. sativa*) shows how Islamic spirituality is contextualized in an ecological and cultural language familiar to the local people. In this way, religious orthodoxy does not exclude cultural expression but reinforces it through meaning transformation and adaptation (Morris 2020).

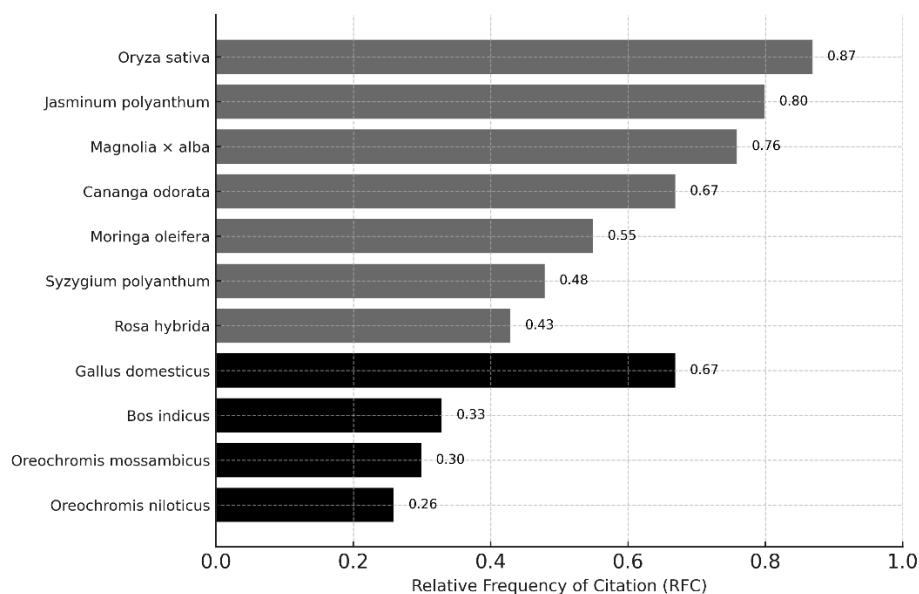


Figure 4. Relative Frequency of Citation (RFC) values of the most frequently mentioned plant and animal species used in funeral and post-funeral rituals in Kalibawang Sub-district, Wonosobo District, Central Java, Indonesia

Moreover, the fusion of Islamic and Javanese traditions has a broader socio-ecological function. It sustains traditional practices that promote the use of diverse local species, thereby supporting both cultural identity and biodiversity conservation. By embedding ecological materials in religious ceremonies, the community preserves not only its faith-based rituals but also the surrounding natural resources that give them meaning.

This integration of Islamic values and local ethnobiological traditions demonstrates the resilience of cultural heritage in Kalibawang of Wonosobo District. It embodies a living dialogue between religion, nature, and community, ensuring that the moral, ecological, and spiritual dimensions of human life remain balanced. The harmony between Islamic doctrine and indigenous practice thus represents a localized model of environmental spirituality—one that aligns devotion to God with the care for nature and ancestral legacy.

Discussion

Ethnobotanical and ethnozoological context of Javanese funeral traditions

The integration of material and spiritual elements in the funeral rituals of the Javanese community of Kalibawang reflects a complex ethnobiological worldview in which humans, nature, and the divine coexist in a harmonious cycle. Plants and animals are not merely utilitarian objects but are perceived as living mediators that bridge the physical and metaphysical realms. The selection of flowers, leaves, fruits, and ritual animals demonstrates the community’s awareness of both ecological availability and symbolic resonance. The act of using natural elements in funeral practices embodies a cultural dialogue with the environment—transforming biological resources into spiritual instruments that express reverence, purity, and moral continuity (Mahdayeni et al. 2019; Wojtkowiak and Mathijssen 2022).

From an ethnobotanical perspective, the use of plant materials such as *M. × alba*, *J. polyanthum*, and *O. sativa* mirrors patterns reported in other regions of Java and neighboring parts of Southeast Asia. In Central and East

Java, for instance, floral mixtures for corpse bathing (*siraman jenazah*) and grave decoration are similarly composed of aromatic and white-colored species that symbolize sanctity and the release of the soul (Marliana 2023; Elyanawati et al. 2024). Comparable findings have also been recorded among Balinese Hindus and Malay Muslim communities, where *C. odorata*, *P. amaryllifolius*, and *C. nucifera* serve as ritual purifiers and mediators between humans and ancestral spirits (Adinugraha et al. 2024; Morris 2020). These cross-cultural parallels indicate that the integration of biological materials into funeral ceremonies is a shared ethnobotanical trait across Southeast Asia—reflecting the region’s ecological richness and the universal human tendency to sacralize nature.

The ethnozoological dimension of the Kalibawang tradition also aligns with broader Southeast Asian patterns. The use of *G. domesticus* as a ritual food offering parallels its symbolic role in Javanese, Malay, and Thai ceremonies, where the chicken represents sincerity, life renewal, and community harmony. Similarly, the inclusion of fish and cattle in post-funeral *selamatan* corresponds to widespread beliefs that animal offerings strengthen social bonds and facilitate the deceased’s peaceful transition. These parallels emphasize that animal use in rituals transcends subsistence, expressing ethical and spiritual values rooted in reciprocity and gratitude (Morris 2020).

Despite gradual modernization and the deepening influence of Islamic orthodoxy, the symbolic traditions of Kalibawang remain remarkably resilient. Religious transformation has not displaced ancestral ritual forms but rather re-contextualized them within an Islamic framework. The practice of mixing flower petals on graves or serving *ingkung ayam kampung* in *selamatan* persists as a localized interpretation of Islamic remembrance (*tahlil*) and charity (*sadaqah*). This cultural continuity demonstrates the adaptability of Javanese ethnobiological knowledge: the community selectively retains meaningful elements of its ecological heritage while aligning them with contemporary religious understanding (Nasution and Rosli 2021; Adinugraha et al. 2024).

Table 5. Integration of Islamic principles, Javanese cultural practices, and ethnobiological elements in funeral and post-funeral rituals of Kalibawang community, Wonosobo District, Central Java, Indonesia

Islamic principle concept	Corresponding Javanese practice	Ethnobiological element	Integrated meaning function
<i>Taharah</i> (spiritual and physical purification)	<i>Siraman jenazah</i> (corpse bathing) using flower water and aromatic leaves	<i>Jasminum polyanthum</i> , <i>Cananga odorata</i> , <i>Citrus hystrix</i>	Cleansing of body and soul; harmony between purity and natural fragrance
<i>Kafan</i> (shrouding the body in white cloth)	Wrapping the corpse and placing symbolic flowers inside	<i>Magnolia × alba</i> , <i>Rosa hybrida</i>	Purity, farewell, and spiritual release
<i>Sholat jenazah</i> (prayer for the deceased)	Communal prayer in home or mosque, often surrounded by flower arrangements	<i>Jasminum polyanthum</i> , <i>Oryza sativa</i> (as offering rice)	Collective remembrance and unity in faith
<i>Sadaqah jariyah</i> (continuing charity)	<i>Selamatan</i> feast after burial, sharing food among villagers	<i>Gallus domesticus</i> , <i>Oryza sativa</i> , <i>Musa paradisiaca</i>	Charity, gratitude, and social solidarity
<i>Zikr and Do’a</i> (spiritual remembrance)	Recitations on 3rd, 7th, 40th, 100th, and 1000th days (<i>tahlilan</i>)	<i>Jasminum polyanthum</i> , <i>Oryza sativa</i>	Sustained remembrance, moral continuity, ecological symbolism
<i>Khalifah fil-ardh</i> (stewardship of Earth)	Preservation of homegarden species for ritual use	37 ritual plant species and 4 animal species recorded	Integration of religion, ecology, and culture through responsible resource use

The persistence of these practices underscores the dynamic character of Javanese spirituality, which harmonizes orthodoxy with ecological symbolism. In this sense, the Kalibawang funeral tradition functions as a living ethnobiological system—a synthesis of ritual ecology and faith—where material and spiritual aspects co-evolve to maintain cultural identity and social cohesion.

Ecological availability and cultural selection of ritual species

The choice of plants and animals used in the funeral and post-funeral rituals of Kalibawang is strongly influenced by ecological availability, local cultivation patterns, and cultural valuation. The majority of species recorded in this study originate from homegardens, agricultural fields, and nearby secondary forests, which are easily accessible to villagers. This ecological proximity supports the continuity of traditional rituals, since the materials needed for sacred practices are always within reach of the community. The abundance of tropical flowers, herbs, and food plants in Wonosobo's fertile volcanic landscape facilitates the incorporation of biological resources into spiritual life, ensuring that ritual practices remain embedded in local ecology (Sulaiman et al. 2022).

The dominance of species such as *O. sativa*, *M. paradisiaca*, *C. nucifera*, *J. polyanthum*, and *C. odorata* reflects both environmental adaptation and cultural selection. These plants thrive under the humid, fertile conditions of Central Java's highlands, while also carrying profound symbolic meanings related to purity, fertility, and devotion. This dual role—ecological suitability and cultural resonance—illustrates how local communities perceive nature not as an external resource but as a spiritual partner that sustains both material life and religious expression (Mahdayeni et al. 2019).

From an ethnobotanical perspective, cultural selection often prioritizes species with aesthetic, olfactory, or ritual qualities. For example, flowers with bright colors and pleasant scents (*M. × alba*, *R. hybrida*, *C. odorata*) are chosen for their association with purity and transcendence, whereas edible species (*O. sativa*, *C. longa*, *Z. officinale*) are preferred for post-funeral feasts symbolizing gratitude and sustenance. These preferences show that ritual biodiversity is not random; it is guided by long-term co-evolution between people's symbolic systems and the local environment. The same tendency has been observed in other parts of Indonesia and Southeast Asia, where culturally important plants are often domesticated or semi-cultivated around human settlements to ensure continuous availability for religious ceremonies (Febrianti et al. 2022; Marliana 2023).

The homegarden system plays a particularly significant role as a cultural-ecological reservoir. In Kalibawang, most of the species used in funeral rituals are found within household gardens that combine food crops, ornamental plants, and medicinal herbs. This multifunctional landscape provides not only practical resources for daily needs but also ensures a sustainable supply of ritual materials. Such systems exemplify the intersection of biodiversity

conservation and cultural resilience—homegardens preserve species diversity while reinforcing social and spiritual practices. Similar findings were reported in ethnobotanical research from West Java and Bali, where ritual plant diversity correlates with agroecological richness and cultural continuity (Adinugraha et al. 2024).

Animal species used in *selamatan* ceremonies also follow patterns of ecological practicality. Chickens (*G. domesticus*), cattle (*B. indicus*), and tilapia (*Oreochromis* spp.) are species commonly raised in household or village-scale systems. Their inclusion in rituals reflects subsistence integration, where species already central to local food production are simultaneously endowed with sacred meaning. This ecological familiarity minimizes economic burden and ensures ritual sustainability across generations (Morris 2020).

In essence, the selection of ritual species in Kalibawang demonstrates a balanced relationship between ecological adaptation and cultural continuity. The community's reliance on locally abundant species reinforces the principle of environmental harmony—a foundational aspect of Javanese cosmology—while ensuring that biodiversity remains embedded in everyday spiritual life. The ethnobotanical and ethnozoological practices of Wonosobo thus represent a model of eco-cultural symbiosis, where ecological availability guides ritual choices, and rituals, in turn, perpetuate ecological awareness and stewardship.

Symbolic representation and spiritual interpretation of species

The symbolic meanings attached to plant and animal species in the Kalibawang funeral tradition reveal the community's complex spiritual framework, where nature serves as a language of expression between the human and the divine. Each species embodies specific virtues that mirror the moral and cosmological dimensions of Javanese thought. The choice of color, scent, and form in ritual species is not arbitrary but a product of centuries-old cultural codification that integrates aesthetic perception, religious devotion, and ecological awareness (Mahdayeni et al. 2019; Wojtkowiak and Mathijssen 2022).

Color symbolism plays a central role in the interpretation of ritual materials. The predominance of white flowers such as *J. polyanthum* and *M. × alba* reflects ideals of purity, sincerity, and spiritual cleansing. White signifies both physical purification—aligned with Islamic *taharah*—and spiritual detachment from worldly desires. Red and pink flowers, represented by *R. hybrida*, symbolize affection and the continuity of human emotional bonds even after death. Green leaves such as *P. amaryllifolius* and *C. hystrix* denote fertility, regeneration, and hope, corresponding to the Islamic concept of *rahmah* (divine mercy). Through this chromatic symbolism, biological traits are transformed into spiritual metaphors that communicate reverence and renewal (Elyanawati et al. 2024).

Aromatic symbolism further reinforces the ritual's sacred atmosphere. The fragrance of *C. odorata* and *M. × alba* is believed to invite tranquility and purity, soothing

both the mourners and the soul of the deceased. In Javanese belief, pleasant scents are associated with divine presence, while foul odors are linked with moral impurity. Thus, the act of using aromatic flowers in *siraman jenazah* (corpse bathing) and *tabur bunga* (grave decoration) is both a physical act of purification and a symbolic gesture of sanctification. This practice parallels ethnobotanical patterns in other Southeast Asian cultures, such as the Malay *mandi bunga* and the Thai *song nam phra*, where fragrant plants are used to mediate between human emotion and the spiritual world (Marliana 2023; Morris 2020).

Morphological symbolism—the interpretation of form and structure—also informs species selection. The upright posture of *M. oleifera* and the sturdy trunk of *C. nucifera* symbolize endurance and spiritual steadfastness, while the segmented structure of *O. sativa* grains represents the continuity of life and sustenance. The rounded shape of *M. paradisiaca* fruits is viewed as a manifestation of cyclical regeneration, linking fertility and eternal remembrance. These morphological associations express the Javanese notion that divine wisdom is embedded in natural forms, and by engaging with these forms through ritual, humans participate in a moral and cosmic order (Sulaiman et al. 2022).

Animal species also hold deep symbolic resonance. The chicken (*G. domesticus*) embodies humility and sincerity, its offering in the form of *ingkung* signifying submission to divine will. The cow (*B. indicus*) represents strength and generosity, while fish (*Oreochromis* spp.) symbolize renewal, peace, and the continuity of life. Each of these animals conveys a moral value that mirrors human aspiration—humility, generosity, and harmony—serving as ethical models within the framework of ritual devotion (Morris 2020; Adinugraha et al. 2024).

The symbolic system of the Kalibawang funeral tradition reveals a spiritual ecology, where biological characteristics—color, fragrance, and form—are reinterpreted through a moral and cosmological lens. This synthesis between physical attributes and metaphysical values reflects the essence of Javanese spirituality: an enduring quest for balance between material life, divine truth, and natural harmony. Through these symbols, the community expresses reverence not only for the deceased but also for the natural world that sustains and sanctifies human existence.

Quantitative insights: Cultural importance reflected by RFC values

The Relative Frequency of Citation (RFC) analysis provides a quantitative reflection of the cultural salience and ritual centrality of species used in the Javanese funeral traditions of Kalibawang. The high variation in RFC values among plant and animal species indicates differing levels of collective recognition and symbolic importance within the community. This quantification helps elucidate how local people prioritize biological resources not only based on availability but also on spiritual significance and ritual function (Mukhoyyaroh and Hakim 2020).

Among plant species, *O. sativa* (RFC 0.87), *J. polyanthum* (0.80), *M. × alba* (0.76), and *C. odorata* (0.67)

exhibited the highest cultural importance values. Their frequent mention across respondents reflects their multifunctional role in both the corpse-handling stages and the commemorative *selamatan*. *O. sativa*, as the staple food and core offering, embodies the principle of sustenance and divine blessing, while *J. polyanthum* and *M. × alba* are associated with purity and spiritual elevation. The quantitative dominance of these species confirms that the most culturally significant plants are those that bridge everyday subsistence with metaphysical symbolism—a finding consistent with ethnobotanical studies in other Javanese and Indonesian contexts. Moreover, all or some of these plant species are invariably present in diverse traditional rituals throughout Java and other regions of Indonesia, where they serve as essential components of ceremonial offerings and symbolic expressions of purity, fertility, and protection (Erawan et al. 2018; Ratnani et al. 2021; Sutraningsih et al. 2019; Sutrisno et al. 2020; Ulfa et al. 2023; Mukarromah et al. 2024).

Species with moderate RFC values (0.40-0.60), such as *M. oleifera*, *S. polyanthum*, and *P. betle*, occupy complementary ritual roles. They are used primarily in purification or as part of *selamatan* dishes, indicating a balance between practical and ceremonial functions. Their moderate citation frequency highlights how ritual biodiversity extends beyond a few dominant taxa to include a supporting ensemble of culturally valued plants, each contributing to the aesthetic, olfactory, and moral completeness of the ceremony.

Species with low RFC values (<0.35), including *D. angustifolia* and *P. tectorius*, are less frequently mentioned but remain important in aesthetic and symbolic contexts. Their inclusion demonstrates that even rarely used species are preserved through cultural memory, maintaining the diversity of ritual flora as part of Javanese ecological knowledge. This long-tail pattern of use—few highly cited species and many infrequently cited ones—is typical of ethnobotanical systems that balance cultural specialization with ecological diversity (Sulaiman et al. 2022).

For animal species, *G. domesticus* (RFC 0.67) was the most frequently cited, followed by *B. indicus* (0.33), *O. mossambicus* (0.30), and *O. niloticus* (0.26). The prominence of *G. domesticus* aligns with its central role as a symbolic offering of sincerity and humility (*ikhlas*), as well as its practical accessibility for ritual feasts. In contrast, cattle and fish are used selectively for specific *selamatan* intervals, representing prosperity, fertility, and peace. The variation in RFC values among animal species reveals that the community distinguishes ritual hierarchy not by quantity of use but by contextual significance—each animal type is assigned a specific spiritual function that complements rather than competes with others (Morris 2020; Adinugraha et al. 2024).

Overall, the RFC analysis quantitatively validates the ethnobiological depth of Javanese funeral traditions. The numerical prominence of certain taxa corresponds closely with their symbolic dominance in the cultural narrative. Plants with higher RFC values tend to appear in multiple ritual stages, whereas species with lower values contribute aesthetic or complementary roles. This pattern underscores

that the community's ritual system operates as a structured hierarchy of meaning, where each biological element—major or minor—fulfills a defined spiritual and social role. Quantitative ethnobiology thus reinforces the notion that cultural significance is not arbitrary but systematically encoded within the material and ecological fabric of Javanese life.

Intergenerational knowledge transmission and social functions of rituals

The persistence of funeral and post-funeral traditions in Kalibawang reflects an effective system of intergenerational knowledge transmission, in which cultural and spiritual wisdom is continuously passed down through family practices and communal participation. Ethnobiological knowledge related to the use of plants and animals in rituals is not learned through formal education but through social immersion, observation, and oral transmission. Elders, *mudin* (religious guides), and traditional caretakers (*sesepuh*) play pivotal roles in this process, acting as cultural custodians who interpret religious principles and symbolic meanings in accessible, localized forms (Sulaiman et al. 2022; Adinugraha et al. 2024).

Ritual involvement begins early in life, as younger generations assist in preparing materials—such as gathering flowers, cooking *selamatan* dishes, or arranging offerings—under the guidance of experienced elders. These participatory experiences function as informal educational settings where practical skills and moral lessons are simultaneously taught. The process ensures that ritual knowledge remains embodied and experiential, rooted in direct engagement with natural materials and collective prayer rather than textual instruction. Such participatory learning echoes traditional Javanese pedagogical systems, where cultural transmission occurs through *nyantrik* (apprenticeship) and *ngajeni* (reverence for elders), fostering deep respect for ancestral wisdom (Mahdayeni et al. 2019).

The social function of these rituals extends beyond spiritual devotion. Funeral and *selamatan* ceremonies serve as platforms for reinforcing community solidarity, reaffirming social ties through shared labor and food distribution. The collective preparation of ritual meals—using rice, banana leaves, coconuts, and chicken—embodies the values of cooperation (*gotong royong*) and compassion (*tepa selira*). In this sense, ritual acts are not only religious expressions but also mechanisms of social cohesion that integrate moral, economic, and ecological dimensions of community life. This finding aligns with ethnobiological research in other Javanese and Malay communities, where ritual feasts maintain collective well-being and reciprocity (Morris 2020; Nasution and Rosli 2021).

However, the continuity of these traditions is increasingly challenged by modernization, urban migration, and changing religious attitudes. Younger people often participate symbolically but may lack deep comprehension of the underlying meanings. Despite this, the adaptability of the tradition—particularly its ability to harmonize

Islamic teachings with local cultural symbols—has enabled it to persist in modified forms. Elders now play a more interpretative role, contextualizing ancestral practices within contemporary religious frameworks so that the rituals remain both spiritually acceptable and culturally meaningful.

Thus, the transmission of ethnobiological and ritual knowledge in Kalibawang demonstrates a dynamic continuity model, where tradition evolves through negotiation between reverence for the past and responsiveness to the present. The social and educational roles embedded in these rituals ensure that the ecological, symbolic, and ethical relationships between humans and nature are continually renewed. Through this intergenerational mechanism, the community sustains not only its religious and cultural heritage but also the moral ecology that underpins its way of life.

Integration of Islamic teachings and local cultural identity

The funeral tradition in Kalibawang exemplifies a unique form of religious-cultural integration, in which Islamic doctrine and Javanese cosmology coexist within a shared spiritual framework. Rather than existing in opposition, Islamic principles such as *taharah* (purification), *sadaqah jariyah* (ongoing charity), and *do'a untuk mayit* (prayers for the deceased) are interwoven with ancestral symbolism rooted in local ecological wisdom. This syncretic adaptation demonstrates how the community reinterprets universal religious values through culturally embedded practices, ensuring that Islam is expressed not as a replacement of tradition but as its continuation in a renewed form (Nasution and Rosli 2021; Adinugraha et al. 2024).

At the ritual level, the process of corpse bathing (*siraman jenazah*), shrouding, and praying is conducted according to Islamic law (*syariat*). However, the use of flowers and fragrant leaves, such as *J. polyanthum* and *C. odorata*, adds layers of local symbolic meaning that reinforce spiritual sanctity. These elements complement the Qur'anic emphasis on cleanliness and purity by invoking the aesthetic and emotional dimensions of faith. Similarly, the post-funeral *selamatan*—a communal feast intended for collective remembrance—aligns with the Islamic concept of *sadaqah* (charitable giving), recontextualized through the Javanese ethos of *gotong royong* (mutual cooperation) and *silaturahmi* (communal solidarity). In this way, religious acts are localized without compromising doctrinal authenticity.

The integration of Islamic and Javanese values can also be understood through the continuum of meaning transformation. Traditional offerings once associated with ancestral worship are now interpreted as symbolic gestures of gratitude to God. For instance, *ingkung ayam kampung* (*G. domesticus*), once believed to appease spirits, now represents humility and submission to divine will (*ikhlas*). The symbolic use of *beras tumpeng* (*O. sativa*) likewise signifies sustenance and divine providence. Through reinterpretation rather than rejection, the community maintains its spiritual connection with the land and its

ancestors while aligning practices with Islamic monotheism (Morris 2020).

This harmonization illustrates the adaptive resilience of Javanese religiosity—a cultural process characterized by accommodation, not assimilation. The ability to preserve indigenous ritual aesthetics within an Islamic moral framework reflects a broader Southeast Asian phenomenon of cultural negotiation between local cosmologies and global faith traditions (Wojtkowiak and Mathijssen 2022). The result is a living Islam, one that is both doctrinally grounded and culturally expressive, shaping a distinct regional identity that values nature, spirituality, and community interdependence.

Furthermore, the integration of Islamic ethics into traditional ethnobiological practices contributes to moral ecology, where environmental stewardship becomes a form of worship. The careful and respectful use of flowers, animals, and food resources during funerals embodies the Islamic principle of moderation (*wasathiyyah*) and gratitude (*syukur*). Thus, the rituals serve not only religious and social purposes but also ecological ones—affirming that spiritual piety and environmental balance are inseparable components of human responsibility.

In essence, the funeral practices of Kalibawang represent a microcosm of how religion and culture can mutually reinforce one another. The blending of Islamic values with Javanese symbolic traditions ensures the continuity of faith within the cultural soul of the community. This synthesis maintains religious devotion, cultural integrity, and ecological awareness—making it a model of spiritual adaptation that sustains both belief and biodiversity in the modern era.

Ethnobiological implications for conservation and cultural sustainability

The ethnobotanical and ethnozoological dimensions of the Kalibawang funeral tradition demonstrate that cultural and biological diversity are mutually reinforcing systems. Ritual practices that employ flowers, food plants, and animals serve not only symbolic and spiritual purposes but also contribute to the maintenance of biodiversity in the surrounding environment. The continued use of species such as *J. polyanthum*, *C. odorata*, *M. × alba*, and *M. paradisiaca* encourages their cultivation in homegardens, ensuring that traditional plant varieties are preserved through everyday and ritual functions. This illustrates the principle of in situ conservation through cultural continuity, where the survival of species is linked to their sustained ritual relevance (Febrianti et al. 2022; Sulaiman et al. 2022).

Homegardens play a critical role as biocultural reservoirs, simultaneously maintaining ecological diversity and social identity. The inclusion of aromatic, medicinal, and ornamental plants used in funerary rituals reflects a community-level conservation mechanism that operates independently of formal ecological management systems. These living collections of ritual flora act as gene banks of cultural memory, where species are preserved not for economic profit but for their aesthetic, moral, and spiritual value. This pattern parallels ethnobotanical findings in

other Javanese and Balinese contexts, where ritual dependence on specific plant taxa sustains agrobiodiversity in both rural and peri-urban settings (Marliana 2023; Adinugraha et al. 2024).

At the ethnozoological level, the inclusion of domestic animals such as *G. domesticus* and *B. indicus* in ritual contexts reflects the community's emphasis on ethical coexistence and responsible resource use. Animal offerings in *selametan* are typically sourced from locally raised stocks, reinforcing small-scale livestock systems that are environmentally and economically sustainable. Moreover, the ceremonial slaughter is performed with religious mindfulness (*halal*) and moral restraint, aligning cultural practice with Islamic ecological ethics. This synergy between ritual, religion, and resource use exemplifies how traditional beliefs can foster conservation-oriented behavior without formal environmental policy intervention (Morris 2020).

The spiritual framework underpinning these rituals promotes an ethic of reciprocity—a moral relationship between humans and nature based on respect, gratitude, and moderation. By viewing plants and animals as sacred companions rather than commodities, the Kalibawang community perpetuates an environmental ethos that aligns with both Javanese and Islamic worldviews. This reciprocal perspective can inform modern conservation approaches by emphasizing that biodiversity protection is not only a scientific imperative but also a cultural and spiritual responsibility (Wojtkowiak and Mathijssen 2022).

However, the sustainability of these ethnobiological systems faces challenges from socioeconomic modernization, declining ritual participation, and reduced species familiarity among younger generations. As market-based preferences replace traditional cultivation, several locally significant plants—especially aromatic species—risk gradual disappearance. Preserving ritual biodiversity therefore requires not only ecological awareness but also cultural revitalization programs that document, teach, and revalue traditional species in contemporary life. Collaborative efforts between local communities, cultural leaders, and conservationists could transform funeral ethnobiology into a platform for community-based biodiversity education.

Ultimately, the Kalibawang tradition exemplifies how cultural heritage functions as a vehicle for biodiversity conservation. The integration of ecological stewardship within spiritual practice ensures that natural resources are used sustainably, respected morally, and transmitted across generations. Maintaining such traditions is not an act of cultural nostalgia, but a pragmatic form of environmental resilience that binds ecological knowledge, ethical conduct, and communal identity into a single living system of sustainability.

Comparative perspectives and theoretical reflections

The ethnobiological findings from Kalibawang align with broader regional patterns in Southeast Asia, where plants and animals are integral to funeral and ancestral rites, reflecting an enduring dialogue between ecology, spirituality, and cultural identity. Across Indonesia,

Malaysia, Thailand, and the Philippines, similar traditions reveal that ritual biodiversity serves as a living repository of moral and ecological values. These cross-cultural parallels underscore that traditional societies in the tropics view death not as an end, but as a transformation—an ecological return that reconnects humans with nature's cycles (Morris 2020; Wojtkowiak and Mathijssen 2022).

In Balinese Hindu funerary customs, for instance, the *ngaben* (cremation ceremony) employs flowers, coconuts, and aromatic woods as symbolic purifiers and mediators between realms (Sujarwo et al. 2020; Ratnani et al. 2021), reflecting the Javanese use of *J. polyanthum* and *M. × alba* in *siraman jenazah* (ritual body cleansing). Similarly, the Malay Muslim *kenduri arwah* (Lestari 2017) and the Filipino *padasal* (novena prayers), together with the Buddhist funerary practices of mainland Southeast Asia (Tambiah 1970; Ebihara 1971; Bunnag 1973; Spiro 1982; Cohen 1991; Luong 2010), demonstrate a shared Southeast Asian tendency toward syncretic ritual adaptation—the blending of universal religious frameworks with indigenous ecological cosmologies (Nasution and Rosli 2021; Adinugraha et al. 2024). In Thailand, Buddhist funerary rites incorporate fragrant plants such as *Michelia champaca* and *C. odorata* as emblems of impermanence and spiritual purity, concepts that parallel Javanese beliefs in the cleansing and sanctifying power of natural fragrance (Marliana 2023).

From a theoretical standpoint, these parallels highlight the value of biocultural diversity—the co-evolution of biological and cultural systems that sustains both ecological integrity and human meaning. The funeral practices in Kalibawang demonstrate how symbolic and ritualized uses of biodiversity help preserve species and landscapes by embedding them in social and spiritual significance. This perspective echoes the principles of eco-spirituality, which posits that ecological balance is inseparable from moral consciousness and cultural expression. In this framework, local traditions function as biocultural feedback systems that regulate human interaction with nature through ethics, aesthetics, and belief (Mahdayeni et al. 2019; Febrianti et al. 2022; Otamendi-Uroz et al. 2025).

Comparatively, the Kalibawang case contributes to the growing body of ethnobiological evidence suggesting that rituals act as custodians of ecological wisdom. In communities where formal conservation mechanisms are limited, cultural practices perform the same function—safeguarding species, maintaining landscape diversity, and reinforcing moral norms of restraint and respect. The maintenance of homegarden flora and domesticated fauna for ritual use represents a culturally embedded conservation strategy that is both sustainable and resilient (Suwardi et al. 2024). These insights affirm that ethnobiology is not merely descriptive but also normative, providing models for sustainable living grounded in cultural ethics.

Furthermore, the study offers theoretical implications for the understanding of cultural resilience in the face of religious transformation. The Kalibawang community illustrates that Islamization does not necessarily entail cultural erosion; rather, it produces a dynamic synthesis in

which spiritual orthodoxy and local ecology coexist in equilibrium. This adaptive process demonstrates that religious faith can reinforce rather than undermine environmental consciousness, especially when ecological stewardship is articulated through spiritual values such as *ikhlas*, *syukur*, and *tawazun* (balance).

The comparative and theoretical reflections drawn from this study reinforce the concept of ritual ecology—a system wherein the human relationship with the environment is mediated through sacred symbolism, ethical reciprocity, and cultural continuity. The Kalibawang funeral tradition thus stands as an exemplary model of biocultural sustainability, showing that preserving rituals is synonymous with conserving biodiversity, transmitting wisdom, and nurturing harmony between the physical and spiritual dimensions of life.

In conclusion, the funeral and post-funeral traditions of Kalibawang, Wonosobo, reflect a deep interconnection between culture, religion, and nature. Plants and animals used in these rituals embody both symbolic and practical values, illustrating how local communities translate ecological resources into spiritual expressions. The integration of Islamic principles with Javanese cosmology demonstrates adaptive cultural resilience, where ancestral traditions are preserved through religious reinterpretation. Quantitative data (RFC values) confirm that species such as *O. sativa*, *J. polyanthum*, *M. × alba*, and *G. domesticus* hold the highest cultural importance. Beyond their ritual role, these species contribute to biodiversity conservation through continuous cultivation and ethical use. The study highlights that sustaining traditional rituals also sustains ecological awareness and moral responsibility, reinforcing the concept of biocultural sustainability as a harmonious model linking faith, environment, and identity in Javanese society.

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REFERENCES

- Adinugraha F, Zubaidah S, Lestari SR, Chua KH. 2024. Ethnobiology of plants and animals used as ubarampe in the Kepungan tradition of the Javanese community of Somongari, Purworejo District, Indonesia. *Biodiversitas* 25 (8): 2521-2532. DOI: 10.13057/biodiv/d250824.

- Bunnag J. 1973. *Buddhist Monk, Buddhist Layman: A Study of Urban Monastic Organization in Central Thailand*. Cambridge University Press, Cambridge. DOI: 10.1017/CBO9780511557576.
- Ciptaningrum AN, Arzan AB, Fadia AN, Wirmaningsih D, Erianti P, Aisyah R, Priyanti, Khairiah A, Des M. 2022. Ethnobotany of Death Rituals Plants in Setu Babakan Betawi Cultural Village. *Prosiding SEMNAS BIO 2022 UIN Syarif Hidayatullah Jakarta*. Pp. 126-138.
- Cohen E. 1991. Death rituals and Buddhist merit in Northern Thailand. *Ethnology* 30 (1): 47-63. DOI: 10.2307/3773515.
- Ebihara MM. 1971. *The Khmer Village: Social Relations in a Changing Society*. Harvard University Press, Cambridge.
- Elyanawati L, Percatawati D, Sulistiyowati TI. 2024. Semiotik tanaman adat kematian di Kabupaten Nganjuk. *Prosiding Seminar Nasional Kesehatan, Sains dan Pembelajaran* 3 (1): 175-179. DOI: 10.29407/an7g0670. [Indonesian]
- Erawan TS, Alillah AN, Iskandar J. 2018. Ethnobotany of ritual plants in Karangwangi Village, Cianjur District, West Java, Indonesia. *Asian J Ethnobiol* 1: 53-60. DOI: 10.13057/asianjethnobiol/y010201.
- Febrianti D, Harisandy MD, Suwardi AB. 2022. The diversity of plant species in the ecotourism zone of Gunung Leuser National Park, Tangkahan, Indonesia. *Jurnal Biologi Tropis* 22 (2): 434-440. DOI: 10.29303/jbt.v22i2.3367.
- Hisyam CJ. 2021. *Sistem Sosial Budaya Indonesia*. Bumi Aksara, Jakarta. [Indonesian]
- Kurnia B, Andini I. 2024. Dinamika kependudukan sebagai sumber pembelajaran ilmu pengetahuan sosial. *Jurnal Inovasi Pendidikan* 7 (1): 193-199. [Indonesian]
- Lestari S. 2017. *Kenduren dalam Tradisi Muslim Ditinjau dari Aqidah Islam Studi di Dusun Tulung Agung Kecamatan Banjit Kabupaten Way Kanan*. [Hon. Thesis]. Fakultas Ushuluddin/Studi Agama Universitas Islam Negeri (Uin) Raden Intan, Lampung. [Indonesian]
- Luong HV. 2010. *Tradition, Revolution, and Market Economy in a North Vietnamese Village, 1925-2006*. University of Hawai'i Press, Honolulu. DOI: 10.21313/hawaii/9780824833701.001.0001.
- Mahdayeni, Alhaddad MR, Saleh AS. 2019. Manusia dan kebudayaan (manusia dan sejarah kebudayaan, manusia dalam keanekaragaman budaya dan peradaban, manusia dan sumber kehidupan). *TADBIR: Jurnal Manajemen Pendidikan Islam* 7 (2): 154-165. DOI: 10.30603/tjmpi.v7i2.1125. [Indonesian]
- Marliana M. 2023. *Pandangan Tokoh Agama terhadap Tradisi Reuhab dalam Adat Kematian di Gampong Keude Seumot Kecamatan Beutong Kabupaten Nagan Raya*. [Dissertation]. UIN Ar-Raniry Fakultas Dakwah dan Komunikasi, Banda Aceh. [Indonesian]
- Morris B. 2020. *Animals and Ancestors: An Ethnography*. Routledge, London. DOI: 10.4324/9781003084556.
- Mukarromah AN, Dzihni A, Azzam AK, Adiningsih AR, Utami AS, Nazar IA, Sunarto, Iskandar J, Saensouk S, Setyawan AD. 2024. Ethnobotany of traditional rituals of Javanese in the city of Surakarta, Central Java, Indonesia. *Asian J Ethnobiol* 7: 22-31. DOI: 10.13057/asianjethnobiol/y070103.
- Mukhooyaroh NI, Hakim L. 2020. Etnobotani pemanfaatan pisang lokal (*Musa spp.*) di Desa Srigonco, Kecamatan Bantur, Kabupaten Malang. *Biotropika: J Trop Biol* 8 (1): 43-53. DOI: 10.21776/ub.biotropika.2020.008.01.07. [Indonesian]
- Nasution AS, Rosli. 2021. Pelatihan penyelenggaraan fardu kifayah terhadap jenazah. *Jurnal Al Muharrir Karimun* 1 (2): 59-64. [Indonesian]
- Otamendi-Uroz I, Quintas-Soriano C, Hanspach J, Requena-Mullor JM, Lagies AS, Castro AJ. 2025. Exploring biocultural diversity: A systematic analysis and refined classification to inform decisions on conservation and sustainability. *Ambio* 54 (10): 1581-1597. DOI: 10.1007/s13280-025-02168-y.
- Ratnani DA, Junitha IK, Kriswiyanti E, Dhana IN. 2021. The ethnobotany of Ngusaba ceremonial plant utilization by Tenganan Pegringsingan community in Karangasem, Bali, Indonesia. *Biodiversitas* 22: 2078-2087. DOI: 10.13057/biodiv/d220457.
- Salmerón-Manzano E, Garrido-Cardenas JA, Manzano-Agugliaro F. 2020. Worldwide research trends on medicinal plants. *Intl J Environ Res Public Health* 17 (10): 3376. DOI: 10.3390/ijerph17103376.
- Spiro ME. 1982. *Buddhism and Society: A Great Tradition and Its Burmese Vicissitudes*. University of California Press, California. DOI: 10.1525/9780520341982.
- Sujarwo W, Caneva G, Zuccarello V. 2020. Patterns of plant use in religious offerings in Bali (Indonesia). *Acta Botanica Brasilica* 34 (1): 40-53. DOI: 10.1590/0102-33062019abb0110.
- Sulaiman AI, Chusmeru, Adi TN, Runtiko AG. 2022. Community empowerment as socio-economic education of tourism villages based on local wisdom. *Educ Q Rev* 5 (3): 54-67. DOI: 10.31014/aior.1993.05.03.524.
- Sutraningsih NKA, Sukenti K, Sukiman, Aryanti E. 2019. Ethnobotanical study on Daksina constituent plants on Lombok Island, West Nusa Tenggara, Indonesia. *Asian J Ethnobiol* 2: 78-83. DOI: 10.13057/asianjethnobiol/y020202.
- Sutrisno IH, Akob B, Navia ZI, Nuraini, Suwardi AB. 2020. Documentation of ritual plants used among the Aceh tribe in Peureulak sub-district, East Aceh, Indonesia. *Biodiversitas* 21: 4990-4998. DOI: 10.13057/biodiv/d211102.
- Suwardi AB, Navia ZI, Mubarak A, Rahmat R, Cristy P, Wibowo SG, Irawan H. 2024. The diversity and traditional use of home garden plants near Kerinci Seblat National Park, Indonesia. *Biodiversitas* 25: 3284-3299. DOI: 10.13057/biodiv/d250750.
- Tambiah SJ. 1970. *Buddhism and the Spirit Cults in North-East Thailand*. Cambridge University Press, Cambridge.
- Ulfa DM, Yudiyanto, Hakim N, Wakhidah AZ. 2023. Ethnobiology study of Begawi traditional ceremony by Pepadun community in Buyut Ilir Village, Central Lampung, Indonesia. *Biodiversitas* 24: 2768-2778. DOI: 10.13057/biodiv/d240530.
- Wojtkowiak J, Mathijssen B. 2022. Birth and death: Studying ritual, embodied practices and spirituality at the start and end of life. *Religions* 13 (9): 820. DOI: 10.3390/rel13090820.