

Utilization of sugarcane in Javanese traditional ceremonies in Surakarta City, Central Java, Indonesia

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Abstract. Naafi DA, Putri DS, Arifiandita DM, Saputra EF, Nurwulandari M, Setyawan AD. 2025. Utilization of sugarcane in Javanese traditional ceremonies in Surakarta City, Central Java, Indonesia. *Asian J Environ* 1: 45-58. Sugarcane is one type of plant that is widely used and utilized by people in various regions. In Surakarta City, Indonesia sugarcane is a common ingredient used in several traditional ceremonies. The research aims to understand and record the various types of sugar cane and how they are used in the context of traditional ceremonies in Surakarta City. The data and information on which this research is based were obtained through a series of interviews with total of 60 respondents in Baluwarti, Mojosongo, and Panularan villages of Surakarta City. The results of this research state that there are seven varieties of sugarcane used in traditional ceremonies in Surakarta, including *tebu wulung/ireng*, *tebu raja*, *tebu kuning*, *tebu arjuno*, *tebu tiying*, *tebu hijau*, and *tebu batu*. From seven varieties found, only five varieties used in traditional ceremony by Surakarta community, there are *tebu wulung/ireng*, *tebu raja*, *tebu kuning*, *tebu arjuno*, and *tebu hijau*. The study reveals that *tebu wulung/ireng* has the highest Use Value (UV = 0.10), appearing in six ceremonies, while other varieties have lower UV values (0.017 each), with each associated with specific rituals. In the context of Surakarta traditional ceremonies, sugar cane is not just an ingredient, but has a deep meaning in its use, maintaining the meaning of traditional ceremonies such as *mantenan*/wedding, *mitoni*/seven months of pregnancy, *buka giling/manten tebu*, *sesajen*, *tuwuhan*, *tedak siten*, *slup-slupan*, *wetonan*, *kirab*, and *sekaten*. Apart from that, this research also shows how sugar cane has the potential to be integrated into modern life without sacrificing the traditional and cultural values that influence Surakarta society.

Keywords: Sugarcane, Surakarta, traditional ceremony

INTRODUCTION

Sugarcane (*Saccharum officinarum* L.) is a *perennial* C4 grass in the Poaceae family, characterized by segmented culms, not branched stems (Magarey 2020). The plant has long, slender leaves with serrated edges (Qiu et al. 2021). Rather than a spiral arrangement, the leaves are distributed along the culm in a pattern typical of grasses (Huo et al. 2023). The sugarcane stem consists of a culm with nodes and internodes, not a branched structure with *marrow* (Rocha et al. 2023). Sugarcane can grow up to 2-6 meters in height, depending on the variety (Datt and Mishra 2023). Typically, it has a striking purplish-green or bluish color, which is characteristic of the species (Rattanapongphak and Boongsod 2019). Sugarcane originated in tropical and subtropical regions and has been widely cultivated worldwide due to its climate resistance (Negrão et al. 2021).

Historically, sugarcane has symbolized wealth and abundance (Singh et al. 2022). In Indonesia, sugarcane is cultivated across several tropical islands, with Java being one of the main producers at the national level (Tegegn and Dhont 2023). In Java, sugarcane thrives and is a key ingredient in the sugar industry, supporting the local economy (Wibowo et al. 2023). Sugarcane (*S. officinarum*) has long been used in various cultural and religious practices worldwide, beyond its role in commercial sugar production. In India, sugarcane is widely used in Hindu

rituals, including the *Ganna Puja* (sugarcane worship) during harvest seasons, symbolizing prosperity, good fortune, and new beginnings. Similarly, in Fiji, sugarcane is integral to traditional ceremonies where it serves as a symbolic offering in *yakona* ceremonies, reinforcing its connection to both fertility and spiritual renewal (Dean 2019). In Latin America, countries like Mexico and Brazil use sugarcane in agricultural festivals, where it is linked to harvest rituals and the cycles of nature. These uses illustrate how sugarcane's role as a symbol of life's sweetness and abundance transcends cultural and geographical boundaries.

In Southeast Asia, particularly Indonesia, sugarcane holds symbolic value similar to that of other regions. In Bali, sugarcane is incorporated in temple offerings and festivals, symbolizing fertility and the fertility of the land (Jezeri and Susanto 2020). Similarly, in Surakarta, the use of sugarcane in traditional Javanese ceremonies such as *mantenan* (wedding) and *mitoni* (seven-month pregnancy ritual) reflects a longstanding cultural practice (Mukarromah et al. 2024). The persistence of these rituals shows the enduring importance of sugarcane as a cultural symbol, representing fertility, spiritual health, and prosperity across different cultures.

In Surakarta, sugarcane plays a significant role in traditional ceremonies, symbolizing abundance and prosperity. The use of sugarcane in Surakarta's rituals is closely tied to the cultural values, history, and local

wisdom of the Javanese people (Virgin 2022). In Surakarta's traditional ceremonies, sugarcane is not only used for its symbolic meaning but also as a material representation of societal values. It is often associated with fertility, blessings, and the hope for a stable life (Wulandari et al. 2023).

While traditions and cultural values continue to be respected, modernization and changing social dynamics have significantly influenced the way sugarcane is used in traditional ceremonies in Surakarta, Central Java, Indonesia (Hatuwe et al. 2021). Modernization has led to changes in preferences, material choices, and the overall prioritization of traditions. Nevertheless, efforts to preserve and maintain traditional values remain an active pursuit within the community, despite these ongoing social changes. Although sugarcane's role in agricultural and economic systems is well-documented, there is a notable lack of systematic documentation regarding its symbolic use in traditional rituals, particularly in Surakarta. Previous studies have largely focused on the economic importance of sugarcane in Indonesia (Wibowo et al. 2023), but few have examined its cultural significance in local rituals and ceremonies. Moreover, research on the diversity of sugarcane varieties used in rituals, the changes in its cultural use over time, and the impact of modernization on its role within Javanese traditions remains limited. This study seeks to address these gaps by providing a comprehensive ethnobotanical analysis of sugarcane's use in Surakarta's traditional ceremonies, documenting the varietal diversity, and examining how social changes and modernization have affected sugarcane's symbolic and ritual use.

This research examine the various types of sugarcane used in traditional ceremonies in Surakarta. It also emphasizes the importance of understanding the cultural meanings embedded in these traditional practices. Through this study, it becomes clear that preserving and respecting traditional values through the continued use of sugarcane in ceremonies can help ensure the longevity of these practices, even as society evolves.

MATERIALS AND METHODS

Study area

This research was conducted in three villages of Surakarta City, Central Java, Indonesia, i.e. Baluwarti, Mojosongo, and Panularan (Figure 1). In the past, Surakarta was the capital of Mataram Kingdom (or Kingdom of Java), so it became the center of Javanese government, economy and culture. In the past, Surakarta was the center of sugar production in Indonesia, where toponyms are still preserved today, such as Tasikmadu and Colomadu, two centers of the sugar industry in tris area (*madu* means honey, tastes sweet like sugar). Surakarta City has a total area of 579,068 Ha with a population of 523,008 with a male and female population composition of 49.19% and 50.81%, respectively. The city of Surakarta has a tropical climate with air temperature ranging between 27.8-30.8°C (Azahra et al. 2024). This city is bordered to the east by Karanganyar District, to the South-West by Sukoharjo District, Central Java and to the north by Boyolali District, Central Java.

Procedures

The research was conducted from November to December 2023. Data were collected through direct interviews with residents of Baluwarti Village, Mojosongo Village, and Panularan Village in Surakarta. This study employed a semi-structured questionnaire to gather information about the use of sugarcane in traditional ceremonies in Surakarta City. The interviews were directed towards key informants, including adults and elderly individuals who regularly use sugarcane in Surakarta's traditional practices. These key informants were selected due to their extensive knowledge of Surakarta's cultural traditions, which provided crucial insights into the role of sugarcane in local rituals.

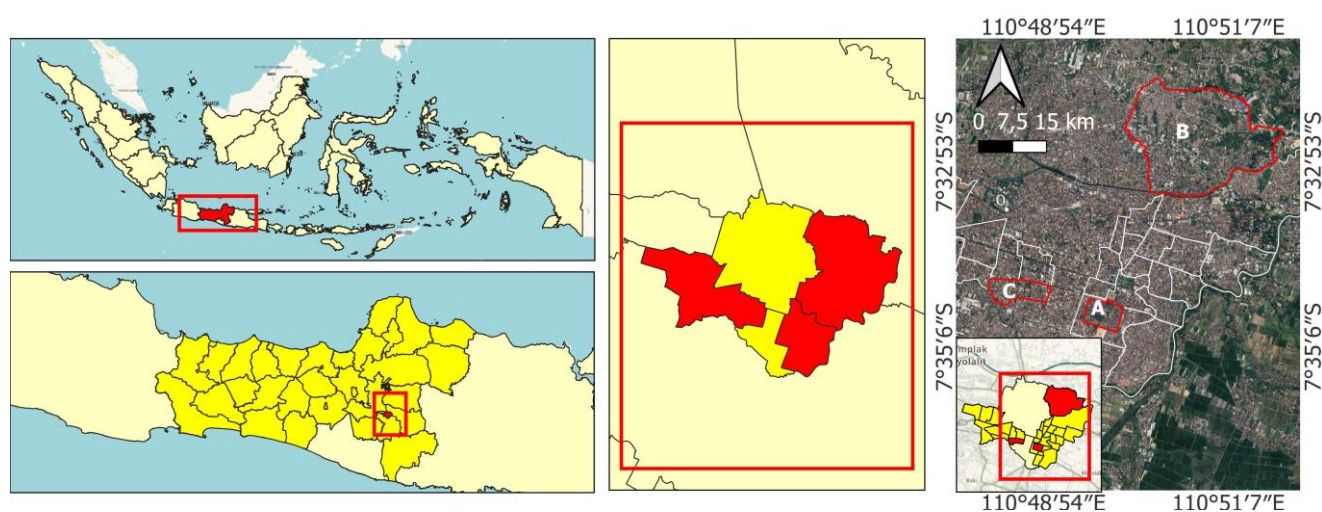


Figure 1. Location of A. Baluwarti Village, Pasarkliwon Sub-district; B. Mojosongo Village, Jebres Sub-district; and C. Panularan Village, Laweyan Sub-district, Surakarta, Central Java, Indonesia

The informants for this study were selected based on their direct involvement in traditional ceremonies and their knowledge of sugarcane's use in these rituals. The criteria for selection are as follows: (i) The primary informants were adults and elderly individuals from Surakarta, specifically those who have extensive knowledge of the cultural traditions involving sugarcane. These informants were selected due to their experience and familiarity with the historical and contemporary use of sugarcane in Surakarta's rituals. Elderly informants were particularly prioritized because of their longer exposure to traditional practices and their ability to provide insights into changes over time. (ii) Informants were selected across a wide age range, from young adults (18+) to elderly individuals (aged 60 and above). This age diversity ensured that both younger and older generations were represented, capturing insights into how sugarcane use has evolved over time in Surakarta's cultural practices. (iii) Respondents were chosen based on their active participation in the rituals that involve sugarcane. These include weddings (*mantenan*), pregnancy rituals (*mitoni*), and harvest ceremonies (*buka giling*), among others. This ensured that the respondents had firsthand knowledge of how sugarcane is used and its symbolic meanings in the local context.

In-depth interviews were the primary method of data collection, complemented by field observations to provide a broader contextual understanding of how sugarcane is utilized in the community (Depari 2022). A total of 60 respondents participated in the study, representing different age groups from both rural and urban areas of Surakarta. The respondents were selected based on their active participation in community rituals and their regular use of sugarcane for ceremonial purposes. This diverse range of informants ensured a comprehensive representation of Surakarta's multigenerational cultural practices.

The questionnaire included several key sections, such as (i) Personal demographic information (age, gender, occupation). (ii) Knowledge and frequency of sugarcane use in traditional ceremonies. (iii) Varieties of sugarcane recognized by the community. (iv) Parts of the sugarcane plant used (stem, leaf, roots.) (v) Symbolic meanings associated with sugarcane in rituals. (vi) Changes in sugarcane use due to modernization and social changes

Use Value (UV) was one of the key indices used to assess the cultural significance of different sugarcane varieties. UV was calculated following the method proposed by Majeed et al. (2020). The Use Value (UV) of each sugarcane variety was calculated using the formula:

$$UV = \frac{\sum U_i}{N}$$

Where:

U_i : the number of different ritual uses reported for each variety, and

N : the total number of informants (60 in this case).

UV is an important ethnobotanical index that reflects the cultural salience and frequency of use of a particular plant species in the community. Higher UV values indicate that the variety is widely used across multiple rituals, making it a key cultural resource. In contrast, lower UV

values suggest that the variety is used only in specific contexts or rituals. This method of analysis helps to identify not only the diversity of plant use but also the importance of each variety in the local culture. In this study, UV was calculated for each sugarcane variety to quantify its role in the traditional ceremonies of Surakarta.

Data analysis

This study employs descriptive analysis to interpret the ethnobotanical data, which will be presented statistically in tables. The plant species, particularly sugarcane varieties, will be classified based on their morphological characteristics, such as color, size, and structural features of the culm and leaves. To assess the use of sugarcane in Surakarta's traditional ceremonies, informants provided information on the number of ceremonies that still incorporate sugarcane and the frequency with which these traditions are practiced. This information will be gathered based on the informants' personal experiences, knowledge, and subjective perceptions (Gunawan 2013).

The analysis will focus on determining whether the use of sugarcane in traditional ceremonies in Surakarta is still high or low, using Use Value (UV) as a quantitative index to assess the frequency and breadth of sugarcane use across different rituals. The UV will be calculated for each sugarcane variety, based on the number of distinct rituals in which the variety is involved. Additionally, the study will compare historical vs. contemporary trends in sugarcane use, providing insight into the impact of modernization on the persistence of sugarcane rituals.

By applying this approach, the study aims to quantify and simplify the representation of sugarcane's role in traditional Surakarta ceremonies, offering a clearer understanding of its cultural significance and current usage within the community.

RESULTS AND DISCUSSION

Socioeconomic characteristics of respondents

The survey involved 60 respondents, equally distributed between male and female participants (30 each) (Table 1). This balance reflects that knowledge and practice of sugarcane utilization in Javanese traditional ceremonies are not gender-exclusive but rather communal cultural knowledge. In Surakarta's ritual context, male participants often engage in public or performative ritual stages such as *kirab* and *buka giling*, while female participants traditionally manage the *ubarampe* (ritual components) and offerings. Such gender complementarity sustains the symbolic meanings of sugarcane representing fertility, sweetness of life, and steadiness of heart within both domestic and communal spheres. This dynamic indicates that ritual knowledge is transmitted bilaterally through social roles, forming a core part of Javanese Traditional Ecological Knowledge (TEK).

In terms of age composition, the productive age group (20-64 years) dominates the sample (85%), while the elderly (>65 years) account for 15%. This pattern suggests that the active transmission and implementation of ritual

practices involving sugarcane are currently maintained by the productive generation who still regularly participate in community events. Nevertheless, the elderly remain crucial cultural custodians, preserving deeper symbolic interpretations for example, the phrase *mantebing kalbu* (steadfast heart) in wedding (*mantenan*) rituals or *tebu mijil kabecikan* (sweet emergence of virtue) in *mitoni* ceremonies. The relatively small proportion of elders indicates a potential decline in intergenerational transfer of symbolic and varietal knowledge, emphasizing the urgency of documentation and revitalization programs to preserve intangible heritage linked to ritual plants.

Regarding education, the majority of respondents completed junior high school (47%) or senior high school (27%), while only 3% attained higher education. This distribution implies that ritual plant knowledge in Surakarta is primarily experiential and orally transmitted, rather than derived from formal education. Local terminologies for sugarcane varieties such as *tebu wulung*, *tebu kuning*, and *tebu raja* are learned through participation in rituals rather than academic sources. The dominance of medium-level education demonstrates that ritual knowledge is shared across social strata, underscoring its role as a living tradition rather than a remnant of the past. However, the limited representation of higher-educated informants also suggests that scholarly documentation of sugarcane's cultural role remains scarce, justifying the academic value of this ethnobotanical research.

The respondents originated equally from three villages Baluwarti, Mojosongo, and Panularan (33% each). This balanced spatial representation allows comparison between the royal-heritage environment (Baluwarti), which retains highly ceremonial events such as *kirab satu sura* and *sekaten* involving sugarcane as a symbol of prosperity and protection, and the more urban community settings (Mojosongo and Panularan), where rituals such as *slup-slupan* and *mitoni* show adaptive modern forms while still using sugarcane as a ritual material. This distribution reflects a cultural gradient from the Keraton-centered preservation of tradition to community-level adaptation demonstrating how ritual plant use evolves without losing its core symbolic essence.

Table 1. Characteristics of respondents

Characteristics	Number of Informants	Percentage (%)
Gender		
Male	30	50
Female	30	50
Age Group		
20-64	51	85
>65	9	15
Education		
No education	2	3
Elementary School	12	20
Junior High School	28	47
Senior High School	16	27
College	2	3
Village's origin		
Baluwarti	20	33
Mojosongo	20	33
Panularan	20	33
Total	60	100

Overall, the socioeconomic characteristics of respondents demonstrate that knowledge and use of sugarcane in Surakarta are shared and continuously reproduced across demographic boundaries. Sugarcane (*S. officinarum*) is not merely recognized as an agricultural commodity but is deeply embedded in the Javanese symbolic ecology, representing moral, spiritual, and ecological values within life-cycle ceremonies such as *mitoni* (prenatal rite), *tedhak siten* (child's first steps), *mantenan* (wedding), and *buka giling* (sugar mill opening ritual). The balanced gender participation, dominance of productive-age respondents, and equal village distribution indicate that cultural knowledge of sugarcane remains actively maintained, though subtle transformations are occurring due to modernization and shifting lifestyles.

Thus, respondent characteristics not only describe demographic composition but also mirror the structure of social knowledge systems in Javanese culture, where symbolic plants like sugarcane mediate between ecological utility and cultural identity. The interplay between empirical experience, inherited spirituality, and adaptive modernization ensures that the cultural significance of sugarcane remains resilient and relevant within Surakarta's evolving sociocultural landscape.

Diversity of sugarcane varieties

The study recorded seven vernacular varieties of *S. officinarum* cultivated or utilized by Javanese communities in Surakarta namely *tebu wulung/ireng*, *tebu raja*, *tebu kuning*, *tebu arjuno*, *tebu tiying*, *tebu hijau*, and *tebu batu*. Although all are locally recognized, only five *wulung/ireng*, *raja*, *kuning*, *arjuno*, and *hijau* are still actively employed in traditional ceremonies (Table 2). This pattern demonstrates that intraspecific diversity has been maintained through cultural selection, not formal breeding. Ritual practice itself serves as a mechanism of selective conservation such as varieties possessing desired symbolic or aesthetic attributes are preferentially cultivated or procured, while others gradually disappear from routine use. The repeated inclusion of *tebu wulung* in *mantenan* and *mitoni*, *tebu kuning* in *tedhak siten*, *tebu raja* in *sekaten*, *tebu hijau* in *buka giling*, and *tebu arjuno* in *wetonan* indicates that ritual frequency functions as a cultural filter reinforcing varietal persistence. Such pattern mirrors observations in other ethnobotanical systems e.g., the maintenance of colored rice landraces in Bali or medicinal chili types in West Sumatra where symbolic and ritual values outweigh agronomic yield in sustaining diversity.

From an ethno-ecological perspective, varietal distribution across Baluwarti, Mojosongo, and Panularan reflects both ecological and social adaptation. Baluwarti, a royal-heritage enclave with humid soils, favors *tebu wulung* and *tebu kuning*, varieties integral to palace-linked ceremonies; peri-urban Mojosongo and Panularan host smaller gardens with *tebu hijau* and occasional *tebu arjuno*, while *tebu tiying* and *tebu batu* once gathered from forest margins are now rarely found. These differences highlight micro-scale adaptation of varietal occurrence to edaphic and cultural conditions, producing a mosaic of agro-

biodiversity embedded in the Surakarta landscape. Locally, farmers and ritual specialists identify which types grow best in certain soils or seasons, demonstrating practical ecological literacy. Comparable patterns occur in traditional sugarcane systems of southern India and Fiji, where local landraces persist in discrete microhabitats because cultural and ecological niches overlap (Krishna 2010; Meier et al. 2023).

The functional and symbolic diversification of sugarcane in Surakarta closely parallels ecological niche differentiation. Each variety fulfills distinct ceremonial functions corresponding to its morphology and perceived essence. Dark-colored *tebu wulung* symbolizes protection and spiritual steadfastness; golden *tebu kuning* conveys purity and blessing; massive *tebu raja* represents wealth and fertility; and bright-green *tebu hijau* embodies renewal and safety at the start of the milling season. This mapping of physical phenotype to symbolic role reveals a biocultural selection process, whereby diversity is not incidental but socially maintained through semiotic assignment. The pattern supports the broader principle that cultural systems can operate as analogues of ecological processes, partitioning varieties into functional ritual niches. Similar associations between color, morphology, and ritual value are documented in the use of banana varieties for Hindu ceremonies in India and taro morphotypes for Polynesian rituals showing that symbolic differentiation is a cross-cultural driver of plant diversification (Bhadula et al. 2018).

Within the global context of sugarcane biodiversity, the Surakarta landraces represent fragments of pre-industrial genetic heterogeneity that have survived outside formal breeding programs. Industrial sugarcane hybrids, optimized for yield and disease resistance, have drastically narrowed the genetic base of cultivated *Saccharum* worldwide. In contrast, Surakarta's culturally maintained canes function as living germplasm archives, conserving allelic and morphological variability through ritual continuity rather than institutional ex situ storage. Ethnobotanical

documentation of such local varieties complements genomic conservation by revealing vernacular genetic resources sustained by intangible heritage. This contribution aligns with international biodiversity frameworks, such as the FAO Global Plan of Action for Plant Genetic Resources, which emphasize the importance of community-based conservation in preserving crop genetic diversity (de Boef et al. 2013).

Surakarta exemplifies urban ethnobotany and small-scale conservation dynamics. Despite being a densely populated cultural city, ritual demand continuously stimulates the cultivation and circulation of traditional sugarcane varieties. Household gardens, temple courtyards, and local markets serve as micro-habitats where genetic and symbolic diversity coexist. Ceremonial cycles like *kirab satu sura*, *sekaten*, and *mantenan* create recurrent socio-ecological loops that guarantee the regeneration and exchange of planting material. This system turns the city into a biocultural refuge, a space where intangible cultural practices sustain tangible biological diversity. Comparable findings have been reported in Yogyakarta, Chiang Mai, and Kerala, where ritual economies maintain crop heterogeneity despite urbanization (Viswanathan 2014; Rahadini 2018, Supasub 2020). Thus, the Surakarta case reinforces that biodiversity and culture are mutually constitutive systems when ritual life persists, varietal richness is preserved; when cultural practice erodes, genetic erosion accelerates.

These findings demonstrate that the diversity of sugarcane varieties in Surakarta is not merely a relic of past agriculture but a living product of biocultural interaction. Cultural selection, ethno-ecological adaptation, symbolic differentiation, global genetic significance, and urban conservation together define a holistic framework in which local traditions contribute directly to global agrobiodiversity. Sustaining these varieties therefore requires protecting not only the plants themselves but also the ritual, linguistic, and ecological contexts that allow them to persist.

Table 2. Diversity of sugarcane varieties found in Surakarta Peneng and Sumantera (2005)

Type of sugarcane	Description
<i>Tebu Ireng/ wulung</i> sugar cane	<i>Wulung</i> sugar cane better known as black sugar cane, is able to grow lengthwise between 3-5 meters, has a diameter of 2-5 cm, has elongated leaves, and hangs along the stem. What distinguishes this sugar cane is that the stems are darker than sugar cane in general, and the flowers are white and yellow. Usually, this sugar cane has a dark red stem color. The juice of this type of sugar cane will be dark in color as well.
<i>Tebu Raja</i>	It has a height of between 5 and 6 meters and a 4-6 cm diameter. This sugarcane variety has a lot of water content and a sweet taste. This sugarcane is called king sugarcane because its size is the largest among other sugarcane varieties.
<i>Tebu Kuning/ yellow sugarcane</i>	It is usually used for sugar making, so it is much sought after by food and beverage manufacturers. Yellow sugarcane has a golden yellow stem with a lot of water content.
<i>Tebu Arjuno</i>	Type of sugarcane variety has more or less the same characteristics as yellow sugarcane, namely having yellow stems and a lot of water content. This sugarcane has a harvest period of 10-11 months.
<i>Tebu Tiyang</i>	this type of sugar cane has a hard and stiff bark like bamboo. It has a slightly yellow stem with a 3-5 cm diameter, an internode length of 5-11 cm, and can reach more than 5 m in height.
<i>Tebu Hijau/green sugar cane</i>	It is the ordinary sugarcane characterized by wide, long leaves and large, twisted stems with green skin. Green sugarcane is harvested when it reaches 9 to 12 months of age.
<i>Tebu Batu/ stone sugar cane</i>	It is a type of sugar cane with the characteristics of its place of life, often in the forest (growing wild); its stems are dark in color and have short leaf ears and round but not prominent bud eyes

Utilization of sugarcane in traditional ceremonies

Based on research carried out in Baluwarti Village, Mojosongo Village, Panularan Village, Surakarta obtained results in the form of data regarding the use of sugar cane in traditional ceremonies in Surakarta, namely as in Table 3. There are 5 varieties of sugarcane used in traditional ceremonies in Surakarta, including the *tebu wulung* sugarcane variety, sugarcanes, which is usually used in sugar production, *tebu ireng*, *tebu kuning*, *tebu arjuno*, and *tebu raja*.

The role of sugarcane in Surakarta's traditional ceremonies can be understood through several key theoretical frameworks in ethnobotany. One such framework is the Cultural Keystone Species (CKS) concept, which posits that certain species, like sugarcane in this case, are essential to the cultural and ecological practices of a community (Cristancho and Vining 2004). Sugarcane's multifunctionality in rituals, from symbolizing protection to fertility, places it as a Cultural Keystone

Species, as its presence and use are crucial for maintaining social cohesion and cultural identity in Surakarta. Its symbolic and functional roles in a variety of rituals ensure its persistence, which aligns with the idea that keystone species are indispensable to the structure and functioning of their cultural and ecological contexts.

Another useful concept for understanding sugarcane's importance is biocultural resilience, which describes the ability of a community to maintain cultural and biological diversity in the face of change (Gavin et al. 2015). In Surakarta, sugarcane's continued use despite modernization reflects biocultural resilience, where the community has adapted its sugarcane-related rituals to modern contexts while still preserving essential cultural practices. The ongoing incorporation of sugarcane into ceremonial life, even in a rapidly modernizing society, highlights its role in strengthening community resilience not just in terms of cultural values, but also in the ecological knowledge that sustains it.

Table 3. A tradition in Surakarta that utilizes the sugar cane plant

Tradition name	Type of cane	Description	Processed	Part used	Meaning
<i>Mantenan</i> /Wedding	<i>Tebu ireng/wulung</i>	A series of events or rituals performed in celebration of the union of two people in a marriage relationship.	Gate Decoration	Stem	<i>Mantebing kalbu</i> /soul stability
<i>Mitoni</i> seven months of pregnancy	<i>Tebu ireng/wulung</i>	A ceremony in javanese tradition performed to give prayers and wishes to the baby still in the mother's womb.	Gate Decoration	Stem	Rejecting bad luck and a symbol of good fortune
<i>Buka giling</i> / <i>Tebu manten</i>	<i>Tebu hijau</i>	A tradition before the sugar production period began in the sugar industry.	Cane Decoration	Stem	Safety
<i>Sesajen</i>	<i>Tebu ireng/wulung</i>	A tradition or ritual of offerings that are usually done as a form of respect to gods, spirits, and things related to spirituality in certain religious traditions or beliefs.	Offerings	Stem	Offerings
<i>Tuwuhan</i>	<i>Tebu ireng/wulung</i>	A culture or tradition from the javanese religion usually carried out to honor ancestors.	Offerings	Stem	Offerings
<i>Tedak siten</i>	<i>Tebu kuning</i>	A tradition from javanese culture is when a child reaches a certain age, usually 7 months after the birth of the child.	Stairs	Stem	Steadiness of heart in living life
<i>Slup-slupan</i>	<i>Tebu ireng/wulung</i>	A ceremony held when someone wants to occupy their new house or is moving house.	Offerings	Stem	Offerings
<i>Wetonan</i>	<i>Tebu arjuno</i>	A tradition in javanese culture that has to do with good days and predictions of one's fate based on the javanese calendar.	Offerings	Stem	Offerings
<i>Kirab</i>	<i>Tebu ireng/wulung</i>	A tradition usually carried out by moving goods or sacred objects from one place to another.	Offerings and decorations	Stem	Offerings and symbols of respect to ancestors.
<i>Sekaten</i>	<i>Tebu raja</i>	A tradition of celebration in javanese culture held to commemorate the birth of the prophet muhammad (<i>peace be upon him</i>).	<i>Gunungan maulud</i> /complementary materials	Stem	The fertility and wealth of the earth

Additionally, the ethnobotanical redundancy hypothesis (Pfeiffer and Voeks 2008) provides another lens for understanding sugarcane's role. This hypothesis suggests that multiple plant species may perform similar ecological or cultural roles, ensuring that cultural practices are maintained even in the face of environmental change. In Surakarta, multiple varieties of sugarcane, such as *tebu wulung* and *tebu raja*, serve overlapping functions in rituals, but each has a unique symbolic role. This redundancy helps ensure the continuity of sugarcane's cultural and ecological functions even if certain varieties become less available or are substituted due to environmental pressures or cultural shifts. By maintaining this redundancy, Surakarta's rituals remain robust and adaptable, preserving their core cultural values while accommodating change.

The utilization of sugarcane in Surakarta City, precisely in Baluwarti, Mojosongo, and Panularan, includes ten traditional ceremonies, namely (i) wedding ceremony or *mantenan*; (ii) *mitoni* ceremony or seven months of pregnancy; (iii) *buka giling* ceremony or *tebu manten*; (iv) *sesajen* ceremony; (v) *tuwuhan* ceremony; (vi) *tedak siten* ceremony; (vii) *slup-slupan* ceremony; (viii) *wetonan* ceremony; (ix) *kirab* ceremony, and (x) *sekaten* ceremony which are forms of sugarcane utilization in traditional ceremonies in Surakarta.

The ethnobotanical documentation in Surakarta revealed that out of seven recognized sugarcane varieties (*S. officinarum*), only five are still actively used in traditional ceremonies, as summarized in Table 3. These are *tebu wulung/ireng*, *tebu raja*, *tebu kuning*, *tebu arjuno*, and *tebu hijau*. Together, they are involved in ten ritual types, indicating a selective and symbolic use of plant diversity maintained through long-standing cultural practice. The other two varieties, *tebu batu* and *tebu tiying*, though known to local communities, are rarely cultivated or mentioned in ceremonial contexts. Their absence in ritual use suggests a process of cultural filtering, in which ecological and symbolic suitability determine which varieties are preserved in collective memory and which gradually decline in practice.

Among the five active varieties, *tebu wulung/ireng* (black cane) holds the broadest cultural significance, appearing in six different rituals namely *mantenan* (wedding), *mitoni* (seven-month pregnancy ceremony), *sesajen* (offering ritual), *tuwuhan* (ancestral veneration), *slup-slupan* (house-moving ceremony), and *kirab satu sura* (sacred procession). This variety's dark purplish stem and towering culm are associated with strength, steadiness of heart (*mantebing kalbu*), and protection against misfortune, reflecting the Javanese cosmological view that black symbolizes firmness and inner stability. Its frequent use underscores *tebu wulung*'s role as a cultural keystone variety, meaning a single plant type that sustains multiple symbolic and ritual functions within the community. The high ritual redundancy of *wulung* being used in both domestic (household) and public (processional) contexts demonstrates how one variety can anchor symbolic continuity across social scales.

By contrast, *tebu kuning* (yellow cane), used exclusively in the *tedak siten* ceremony, embodies a more specific symbolic niche. Its golden color represents purity, blessing, and the transition of a child toward life's stability. Though limited to one rite, its deep cultural association maintains its importance within family-centered traditions. Similarly, *tebu hijau* (green cane) is tied to *buka giling* (the opening of the sugar milling season) and symbolizes safety and renewal. Its use marks the linkage between ritual and local livelihood, bridging symbolic practice with agricultural productivity. *Tebu raja* (king cane), featured in *sekaten*, serves as a material offering within the *gunungan maulud*, representing fertility and prosperity of the earth, and thus reflects the integration of Javanese cosmology with Islamic commemorative traditions. Finally, *tebu arjuno* appears in *wetonan*, a personal-spiritual rite that combines Javanese and calendrical elements, where it acts as a mediator of ancestral blessing and spiritual balance.

The clustering of these five varieties across ten rituals reveals a pattern of symbolic specialization combined with functional redundancy. Certain varieties, especially *wulung*, demonstrate high cultural flexibility, while others are ritual specialists confined to specific symbolic domains. This pattern parallels ecological systems, in which species differ in niche breadth and redundancy within ecosystems. Hence, Javanese ritual plant use can be viewed as a cultural analogue of ecological diversification, where morphological and color traits black, yellow, green, and large-sized forms correspond to symbolic ecological niches in ritual space. Such a system of biocultural specialization ensures that diversity is not only maintained but socially structured, preventing the homogenization of cultural material through continuous ceremonial differentiation.

From an ethno-ecological viewpoint, the concentration of *tebu wulung* in multiple rites also reflects its availability and adaptability to various ritual contexts. Informants noted that *tebu wulung* is easier to obtain in local markets and is cultivated in small home gardens near Baluwarti, the Keraton's cultural core. In contrast, rarer types such as *tebu tiying* (with a hard, bamboo-like rind) and *tebu batu* (wild-type cane) are difficult to access due to land-use change and the shrinking of peri-urban agricultural zones. Consequently, accessibility and ecological availability interact with symbolic preference, shaping which varieties remain visible in urban ritual life. This reinforces the notion that cultural and ecological factors co-produce varietal persistence, a finding consistent with biocultural research in other Southeast Asian traditions where market access and spiritual symbolism jointly drive the maintenance of crop diversity.

The total of ten identified rituals further illustrates the breadth of sugarcane's ritual ecology in Surakarta, spanning the entire human life cycle from pregnancy (*mitoni*), birth and early childhood (*tedak siten*), adulthood and marriage (*mantenan*), to broader communal and religious celebrations (*kirab*, *sekaten*, *buka giling*). This continuum confirms that sugarcane is not a peripheral or auxiliary ritual material, but rather a core plant species embedded in the Javanese ceremonial landscape. The near-exclusive use of the cane's stem across rituals (Table 3)

highlights the symbolic centrality of the cane's upright, segmented form interpreted as a metaphor for strength, continuity, and the connection between human and spiritual realms. Although minor local variants exist (e.g., incorporation of leaves in mitoni siraman water), these do not alter the primary interpretation that the stem functions as a ritual axis a structural and spiritual connector across rites.

Mantenan

A wedding or *mantenan* ceremony is a series of events or rituals performed to celebrate the union of two people in a marriage relationship. The wedding ceremony has many variations based on each culture and tradition. Various tribes in Indonesia and their cultures have their own characteristics in the *mantenan* or wedding ceremony, including the wedding ceremony in Java, which utilizes plants as one of the ornaments in the wedding ceremony (Maghviroh et al. 2021). The *mantenan* ceremony in Java is a series of traditional rituals at a wedding event based on Javanese culture. The *mantenan* ceremony has various rituals such as *siraman*, *midodareni*, marriage contract, and reception. Each ritual or stage performed in the traditional *mantenan* ceremony has its own meaning that reflects the hope of achieving a harmonious household. Sugarcane is one of the symbolic signs used in the ceremony. The utilization of sugar cane in the *mantenan* ceremony includes the *siraman* ritual as a symbol of self-cleansing. The water used for the *siraman* ritual is a mixture of coconut water and sugar cane leaves, symbolizing self-cleansing to start a new phase of life. Sugar cane is also used as decoration in *mantenan* ceremonies, where the stems and leaves of sugar cane are used to decorate the bridal aisle. Moreover, using sugar cane as decoration can mean *manteb ing kalbu* or a feeling of certainty and stability in their mind to start a married life. It can be a symbol of authenticity that emphasizes the importance of manners in the household. The varieties of sugar cane used in the *mantenan* ceremony are *wulung* or black sugar cane and yellow sugar cane.

Mitoni

The *mitoni* ceremony is a ceremony in the Javanese tradition carried out to give prayers and hope to the baby still in the mother's womb. The *mitoni* ceremony is performed when the womb of the baby's mother reaches the age of seven months of pregnancy, where seven in Javanese is *pitu*. Hence, the *mitoni* ceremony is an absorption of Javanese, meaning a seven-month pregnancy ceremony. Based on the belief in folklore or traditional stories circulating in addition to the stem, one of the other parts used in the *mitoni* ceremony is sugar cane leaves. The sugar cane leaves will be wrapped around the pregnant woman's stomach, and then the leaves will be cut using a kris (Mahmuda and Akyun 2023). In the *mitoni* ceremony, sugar cane is used as a symbolic sign, which means *anteping kalbu* or steadiness of the heart, which reflects the hope that the baby who is born will have a steady and unchanging heart or firm stance. In addition, sugar cane symbolizes protection for the baby, such as a repellent or

warding off all bad things that might disturb the baby following Javanese belief. The stem is part of the sugar cane used in this *mitoni* ceremony, which symbolizes luck, fertility, and hope. The varieties of sugar cane often used in *mitoni* ceremonies are black, *wulung*, and ordinary sugar cane.

Buka giling /tebu manten

In addition to the two ceremonies above, one traditional ceremony is usually carried out using sugar cane as one of the symbols in the series of traditional ceremonies, namely the *buka giling* ceremony. The *buka giling* ceremony is a tradition before the sugar production period begins in the sugar industry. This tradition usually occurs about a week before the milling period begins. The purpose of this tradition is as a symbol of prayer and hope that during the production or milling period, everything will run smoothly, safely, and with maximum results. The sugarcane used in this tradition is usually the same as sugarcane production. The sugarcane used is selected with conditions such as having a large diameter, ideal length, good color, and cleanness. The sugar cane chosen for this tradition is as many as two sugar canes, called *tebu manten* sugar cane. The tradition of *tebu manten* must be carried out because it is a symbolic procession. This tradition has become an annual tradition of the sugar factory during the open milling season (Antikasari et al. 2023). After being selected, the *tebu manten* is bathed in flower water and decorated with ribbons, like a usual bride to make it look beautiful. *Tebu manten* will then be paraded to the production site or factory along with one woman and one man who has been made up to be like real brides as a symbol. After the procession and prayers are completed, the *tebu manten* will then be milled as a symbol of the production opening or the factory's milling period. The variety of sugar cane used in this tradition is the same as the sugar cane that will be used to produce sugar.

Sesajen

The *sesajen* ceremony is a tradition or ritual of offerings usually carried out as a form of respect for gods, spirits, and things related to spirituality in certain religious traditions or beliefs. *Sesajen* can be interpreted as objects needed or used in a traditional or ritual event called offerings (Rohman et al. 2024). Offerings are usually in the form of food, drinks, incense, various kinds of flowers, and items considered sacred in rituals. The *sesajen* ceremony is usually carried out depending on the beliefs held by each tribe and culture. Sugarcane is one of the plants used in the *sesajen* ceremony, and part used is the stem as a symbol of offering. The variety of sugar cane often used for *sesajen* ceremonies is *wulung*.

Tuwuhan

The *tuwuhan* ceremony is one of the cultures or traditions from the Javanese region and is usually carried out to honor ancestors. *Tuwuhan* also means plants as a symbol that reminds humans of their duties in serving life and has its meaning in Javanese culture (Mualimin et al. 2025). In this ceremony, there will usually be ritual

offerings in the form of food, drinks, incense, and various kinds of flowers. In addition, a series of prayers or mantras are also carried out to expect blessings and protection from the ancestors. In the *tuwuhan* ceremony, sugar cane is used as one of the offering contents. The part of the sugar cane used for offerings in the *tuwuhan* ceremony is usually the stem, while the sugar cane variety used is black or *ireng*.

Tedak siten

This ceremony is one of the traditions of Javanese culture, namely that when a child reaches a certain age (Primaniarta and de Mattos 2022), usually 7 months after birth, the child will be placed on the ground decorated with symbols such as *gunungan* and others. The *tedak siten* ceremony cleanses the child, protects them from negative things, and makes them always blessed and safe. In the *tedak siten* ceremony, sugarcane is used as a decoration or symbol. The part of the sugarcane used is the stem, and the varieties of sugarcane often used in this ceremony are yellow and black, Hanipudin and Sari (2023) stated it is symbolizing the steadfastness of the heart during the *tedhak siten* procession.

Slup-slupan

The *slup-slupan* ceremony is held when someone wants to occupy a new house or is moving house (Anggraini et al. 2025). This ceremony is almost similar to a Thanksgiving event, with a series of events such as prayers together to gather until nighttime. In the *slup-slupan* ceremony, sugar cane is used symbolically. Part of the sugarcane used is the stem, while the sugar cane variety most often used in this ceremony is black or *ireng*.

Wetonan

The *wetonan* ceremony is a tradition in Javanese culture that links to good days and predictions of one's fate, which are based on the Javanese calendar count. In the Javanese language, *wetonan* means coming out, and this *wetonan* ceremony is interpreted as a commemoration of the birth of someone who intends to pray for the baby to get blessings (Yahya et al. 2022). *Wetonan* usually refers to two elements, namely *pasaran* and *weton*. In *wetonan* ceremonies usually have a series of events, such as prayers, offerings, and spiritual activities, intending to get blessings. In the *wetonan* ceremony, sugar cane is not the main part but only a complement or symbol. The sugarcane part used in *wetonan* ceremonies is usually the stem, while the sugarcane variety is usually used is *arjuno*.

Kirab satu sura

The *kirab satu sura* ceremony is a tradition that is usually carried out by carrying or moving goods or sacred objects from one place to another. *Kirabs* are usually held to commemorate a religious or cultural event. It usually involves rituals such as prayers, mantras, offerings, and music. One of the *kirab* ceremonies still carried out today is the *kirab satu (1) sura*. This ceremony honors the ancestors and increases faith and gratitude to God Almighty. This *kirab* ceremony is usually held on 1 Muharram or 1 Shura (Astuti and Lestari 2022). The

utilization of sugar cane in the *kirab* ceremony can vary, usually used as decorations, symbols, and offerings. The part of the sugar cane that is usually used is the stem, while the sugar cane variety usually used in the *kirab* ceremony is *ireng* or black.

Sekaten

The *sekaten* ceremony is a tradition of celebration in Javanese culture that is held to commemorate the birthday of the Prophet Muhammad (peace be upon him). The word *sekaten* comes from the name of one of the *gamelans* belonging to the Yogyakarta palace, which will be played during the celebration of the *maulid* of the Prophet Muhammad (peace be upon him) (Ahmad et al. 2021). The *sekaten* ceremony is usually carried out over a fairly long and festive period. There are usually several events, such as *grebeg maulud*, night markets, and traditional art performances. Sugar cane in the *sekaten* ceremony is usually used as part of the *gunungan maulud*, a *gunungan* containing various types of foodstuffs, agricultural products, and others. Sugarcane is one of the agricultural products presented in the *gunungan maulud*, which will then be distributed to the community. The part of the sugarcane utilized in the *gunungan maulud* for the *sekaten* ceremony is the stem. The variety of sugarcane used in the *sekaten* ceremony is *raja*.

Based on Table 3, it exemplifies how selective cultural use of five sugarcane varieties across ten rituals reflects an intricate biocultural system sustained through symbolic association, ecological availability, and ritual continuity. The persistence of *tebu wulung* and its recurrent symbolic meanings make it a biocultural keystone variety of Surakarta's ethnobotanical landscape, while the presence of specialized types (*kuning, raja, hijau, arjuno*) demonstrates cultural mechanisms that preserve intraspecific diversity through differentiated ceremonial functions. These findings align with global patterns in ethnobotany where ritual specialization and symbolic redundancy act as parallel processes to ecological diversification, ensuring that both cultural and genetic diversity remain embedded within living traditions.

Use Value

The calculation of Use Value (UV) shows how frequently each sugarcane variety is used across different traditional ceremonies in Surakarta. Based on Table 4, only five of the seven identified varieties are currently used, and the variation in UV clearly reflects their differing ritual importance. *Tebu ireng/wulung* has the highest UV (0.10) because it appears in six ceremonies *mantenan, mitoni, sesajen, tuwuhan, slup-slupan, and kirab*. This indicates that *tebu wulung* is a cultural keystone variety with broad symbolic flexibility and social familiarity. Its dark purple culm and tall form are perceived as symbols of firmness, protection, and spiritual steadiness, explaining its acceptance across domestic, communal, and royal rituals.

Table 4. Use value of sugarcane varieties in traditional ceremony use

Sugarcane varieties	Ritual	n	UV
<i>Tebu ireng/wulung</i>	<i>Mantenan, mitoni, sesajen, tuwuhan, slup-slupan, kirab</i>	6	0,1
<i>Tebu hijau</i>	<i>Buka giling/tebu manten</i>	1	0,017
<i>Tebu kuning</i>	<i>Tedak siten</i>	1	0,017
<i>Tebu arjuno</i>	<i>Wetonan</i>	1	0,017
<i>Tebu raja</i>	<i>Sekaten</i>	1	0,017

Notes: n = Number of ritual use, UV = Use Value

All other varieties *tebu hijau*, *tebu kuning*, *tebu arjuno*, and *tebu raja* have much lower UV values (0.017 each) because each is tied to a single specific ritual. *Tebu hijau* is limited to *buka giling/tebu manten*, symbolizing safety and renewal; *tebu kuning* appears only in *tedak siten*, representing sanctity and blessing; *tebu arjuno* is used in *wetonan* for offerings; and *tebu raja* in *sekaten*, symbolizing fertility and prosperity. These cases show ritual specialization, where each variety fills a distinct symbolic niche within Javanese cosmology. The UV pattern thus forms a core-periphery model: *tebu wulung* as the core (generalist, multifunctional) and the other four as peripheral specialists. Such a structure helps preserve intraspecific diversity specialists maintain symbolic authenticity while the generalist secures ritual continuity even when other types become scarce.

The calculated Use Value (UV) highlights clear differences in the cultural salience and ritual breadth of sugarcane varieties in Surakarta. The high UV of *tebu wulung/ireng* (0.10) indicates that this variety plays a central role in maintaining ritual continuity, while the lower UV of other varieties (0.017 each) reflects specialized symbolic functions. When interpreted within broader ethnobotanical frameworks, these results provide both local insights into Javanese ritual ecology and comparative relevance to global biocultural systems.

Tebu wulung/ireng - The cultural keystone variety

The highest UV (0.10) for *tebu wulung* demonstrates its dominant multifunctional status within Javanese ceremonial life. Its use in six rituals from domestic (*mitoni, tuwuhan*) to public (*kirab, mantenan*) shows that it is not just a plant but a cultural connector between social, spiritual, and ecological domains. The dark purple stem symbolizes *keteguhan batin* (spiritual steadfastness) and *tolak balak* (protection from misfortune), making it suitable for almost every ceremonial setting.

Locally, this mirrors the ethnobotanical role of multi-use species such as *Piper betle* L. (*sirih/betel*) or *Cocos nucifera* L. (*kelapa/coconut*) in Javanese culture plants that persist because of their broad symbolic and practical value. Globally, this pattern parallels findings in South Asia and the Pacific, where specific plant varieties attain *keystone* status for instance, the black cane (*Saccharum officinarum* var. *violaceum*) used in Fijian *yakona* ceremonies (Dean 2019), or red rice landraces (*Oryza sativa* var. *indica*) used in Balinese temple offerings (Huang 2020). In both local and global cases, high-UV species are typically

multifunctional, visually distinct, and symbolically charged, serving as carriers of collective identity.

Tebu hijau - Ritual continuity through livelihood integration

Tebu hijau has a lower UV (0.017) but plays an essential role in *buka giling* (the sugar-milling opening ceremony). This ritual bridges economic and ritual spheres, invoking *slamet* (safety) and agricultural renewal. Its moderate UV suggests a link between ritual and livelihood, comparable to sugarcane blessing ceremonies in India’s Maharashtra region (Chaudhari and Jaggi 2020) and the *Ganna Puja* of Uttar Pradesh, where green canes are used to sanctify the sugar harvest. Locally, *tebu hijau* represents the pragmatic face of ritual continuity its survival depends on agricultural practice rather than deep symbolic specialization.

Tebu kuning - Symbolic purity and intergenerational transition

The yellow cane (*tebu kuning*), used exclusively in *tedak siten*, holds UV = 0.017, reflecting high symbolic specificity but low ritual frequency. In Javanese semiotics, yellow represents holiness and hope meanings inherited from pre-Islamic Hindu-Buddhist cosmology. Its single but deeply meaningful function parallels high-symbolism, low-frequency species observed globally, such as *Curcuma longa* L. (*kunyit/turmeric*) in Indian naming or birth rituals (Chakraborty et al. 2011). The persistence of *tebu kuning* in child-centered rites illustrates how ethnobotanical diversity persists through life-cycle symbolism, where each stage of life is tied to a specific plant emblem.

Tebu arjuno - Spiritual propitiation and selective preservation

Tebu arjuno (UV 0.017), appearing in *wetonan*, represents a narrow but enduring symbolic domain ancestral appeasement and personal spiritual balance. The name *Arjuno*, taken from Javanese epics, conveys nobility and virtue, showing how linguistic symbolism reinforces botanical identity. Comparable restricted-use varieties are found in Polynesia, where particular kava (*Piper methysticum* G.Forst.) cultivars are reserved for priestly rites (Lindstrom 2004). The persistence of *tebu arjuno* thus illustrates cultural curation of minor varieties through ritual specialization, helping maintain varietal diversity even when agronomic relevance declines.

Tebu raja - Prestige and fertility symbolism in public ritual

Tebu raja is associated with *sekaten*, the annual commemoration of the Prophet Muhammad’s birth, and symbolizes fertility, abundance, and social harmony. Although its UV is low (0.017), its ritual visibility is high due to public participation. The use of large, bright-stemmed canes parallels practices in Southeast Asia where large-stature cultivars are associated with power and prosperity, such as giant bamboo (*Dendrocalamus asper* (Schult.f.) Backer) in Thai *Bun Bang Fai* festivals (Saensouk et al. 2025). Hence, *tebu raja* functions as a

status symbol variety, culturally maintained for its ceremonial grandeur rather than its frequency.

The UV distribution pattern one generalist (*tebu wulung*) and four specialists (*tebu hijau, kuning, arjuno, raja*) reflects a biocultural strategy of resilience. Locally, it ensures continuity of ritual even when environmental or market changes limit plant availability. Globally, similar core-specialist structures appear in ritual plant systems of Nepal (Castagnetti et al. 2021), indicating that cultural redundancy within species diversity functions as a safeguard for heritage preservation.

In Surakarta, this pattern also shows that ritual specialization maintains genetic and morphological heterogeneity of sugarcane. High-UV varieties anchor practice, while low-UV types act as reservoirs of cultural and biological diversity. If modernization reduces ritual frequency, low-UV varieties are at risk mirroring global trends where cultural erosion directly causes loss of landraces (Zenderland et al. 2019). Thus, sustaining ceremonial diversity directly supports on-farm conservation of traditional sugarcane germplasm, linking ethnobotany and biodiversity management.

Modernization has brought significant changes to many aspects of life in Surakarta, including the use of sugarcane in traditional ceremonies. Social changes, such as urbanization, globalization, and shifting values, have influenced the frequency and manner of sugarcane use in rituals, even though much of the symbolic and traditional value remains intact within the community.

Some informants revealed that although they continue to use sugarcane in ceremonies such as *mantenan* (wedding) and *mitoni* (seven-month pregnancy ritual), they often substitute traditional varieties with varieties that are more easily available or lower quality. This suggests the influence of modernization and limited access to traditional resources. The shift in material choices and the practicality of using sugarcane in rituals highlights cultural adaptation in response to modern pressures. As found in this study, the use of more easily accessible varieties from local markets demonstrates changes in varietal preferences due to economic factors and market availability.

Furthermore, while the symbolic value of sugarcane remains intact, some more domestic or private rituals may have seen a reduction in the use of sugarcane as part of personal ceremonies, as there have been shifts in social priorities and ritual material preferences. This is consistent with findings by Gunawan (2013), who observed that in evolving traditions, ritual materials are often altered to align with lifestyles that are more modern or convenient, such as using more affordable materials or substitutes for traditional ones.

Modernization has also influenced the choice and access to ritual materials in Surakarta. Some informants mentioned that sugarcane is now less frequently planted around residential areas and is more often obtained from local markets or ritual supply stores, indicating a shift from domestic farming to commercial sourcing of ritual ingredients. Despite this, communities in Baluwarti, closer to the Keraton, still practice growing sugarcane in their home gardens, demonstrating active conservation of

traditional practices despite the changes in agricultural methods.

Sugarcane preservation efforts

Sugar cane in traditional ceremonies based on information from the community is still often done in Surakarta. However, many people do not understand the meaning of sugar cane in the traditional ceremony itself. The average mentions that sugar cane is only used as a complement and only continues the tradition that has existed since ancient times. Based on the research, out of 60 respondents in three villages, namely Baluwarti, Mojosongo, and Panularan Villages, 36 respondents mentioned that the custom was carried out from generation to generation; 9 respondents mentioned that the custom was carried out because the *Kejawen* belief was still strong, 12 respondents mentioned that the custom was carried out because of the habits of the surrounding community; and 3 respondents mentioned that the custom was carried out because the respondents were in the palace area, especially in Baluwarti Village (Figure 2). However, based on the results of the qualitative analysis conducted, many people still plant sugar cane themselves. Even though there are no sugar cane plantations around the research location, the community can still get sugar cane for traditional ceremonies obtained from their planting. The sugar cane planted by the community cannot be called a plantation because the area is still limited, and only several stems are planted.

The research location is in the middle of a Javanese tribe that is very rich in customs. However, it does not rule out the possibility that existing customs will disappear. So, preserving the traditional ceremony and its materials, including the planted sugar canes, is necessary. There needs to be a community group used as a driver or pioneer of preservation or can be referred to as a customary group. This group invites the wider community not to forget their existing customs. Of course, there needs to be active participation and support from the community. Furthermore, the formation of culturally aware groups aims to develop the social and cultural life of the community by strengthening and preserving local wisdom (Rahim 2022).

Cultural Factors Influencing the Persistence of Sugarcane Use in Surakarta Ceremonies

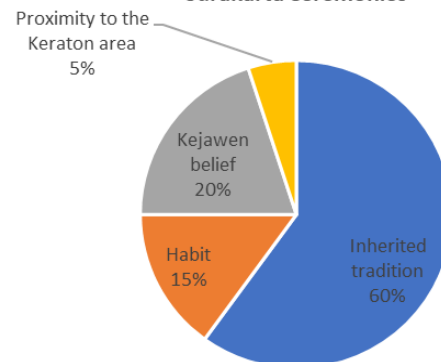


Figure 2. Data on the preservation of sugarcane use of Surakarta ceremonies respondents

Several efforts to introduce traditional ceremonies worldwide can also help preserve the existence of this custom; combined with teaching this custom to the next generation, it will strengthen the position of existing customs. Again, with the awareness and support of the community, which wants to commit to and jointly maintain the preservation of customs. Fostering a love for the country is preferred in implementing this effort so that despite the times and globalization, customary preservation can still be maintained. Customary preservation efforts carried out by the community are expected to be able to encourage their preservation motives and can be passed down to the next generation (Adam and Corry 2020).

The continuity of sugarcane use in Javanese rituals across Surakarta is deeply rooted in local cultural heritage and community identity. As shown in the data (Figure 2), the strongest factor influencing this persistence is inherited tradition (60%). In Surakarta's social context, the phrase *warisan leluhur* (ancestral legacy) is not only symbolic but also moral it expresses an obligation to sustain the customs practiced by forebears. Families in Baluwarti, Mojosongo, and Panularan continue to include sugarcane in their rituals because *wis saka biyen* (it has been done since the ancestors). This inherited behavior is reinforced through *gotong royong* (collective participation) in wedding and mitoni ceremonies, where neighbors help prepare the ritual attributes (*ubarampe*) together. The act of using sugarcane therefore becomes both a material expression of lineage continuity and a social reinforcement of communal harmony, in line with the Javanese concept of *rukun* (social concord).

The second factor, cited by 20% of respondents, is the persistence of *Kejawen* belief. This syncretic spiritual system still strongly influences the cultural life of Surakarta, especially in communities close to the Keraton Kasunanan and Pura Mangkunegaran. In rituals like mitoni and *tedhak siten*, the presence of sugarcane embodies *slamet* (spiritual safety) and balance between the human and the divine. The endurance of these interpretations shows that ritual plants in Surakarta function as mnemonic symbols of *Kejawen* spirituality, preserving intangible philosophy through tangible material culture.

Another 15% of respondents attributed the ongoing practice to habit and social conformity. Even when philosophical meanings fade, social norms encourage continuity using sugarcane feels proper. In this sense, habit becomes a subtle cultural mechanism maintaining tradition through everyday repetition. Younger generations, particularly in Mojosongo and Panularan, may follow ritual forms out of respect for elders rather than doctrinal belief yet their participation sustains the performative dimension of heritage. Such habitual practice exemplifies what anthropologists call living tradition continuity through social rhythm rather than explicit instruction.

The smallest proportion, 5%, indicated proximity to the Keraton area as the reason for persistence. In Baluwarti, where the royal compound (Keraton Kasunanan Surakarta Hadiningrat) stands as the heart of Javanese aristocratic culture, traditional rituals are still practiced with formal symbolism and palace-style arrangements. Residents living

nearby often serve as caretakers (*abdi dalem*) or artisans who prepare ritual props for palace events such as Kirab 1 Sura or Sekaten. Thus, physical closeness to the Keraton indirectly reinforces familiarity with ritual procedures and material culture. However, the small percentage implies that ritual knowledge has diffused beyond the palace walls, becoming part of urban communal culture rather than remaining exclusive to royal households.

Overall, these findings reflect how local sociocultural structures family lineage, spiritual worldview, collective habit, and the Keraton heritage interact to sustain sugarcane use in ceremonies across Surakarta. The dominance of intergenerational transmission aligns with the Javanese moral principle of *nguri-uri kabudayan* to preserve and nurture culture as a moral duty. The presence of *Kejawen* elements keeps ritual symbolism meaningful, while community habit ensures its continuity in everyday practice. Meanwhile, the Keraton's influence provides legitimacy and aesthetic reference for ceremonial forms. Together, these elements form a biocultural feedback system unique to Surakarta, where symbolic plants like sugarcane are preserved not merely as ritual commodities but as living embodiments of *rukun*, *slamet*, and *warisan leluhur* the very values that define Javanese cultural ecology.

Several efforts to preserve sugar cane from the belief of planting in every house with the symbol of rejecting bad luck are quite effective and can maintain the existence of the sugar cane plants. Sugar cane plants have a fairly good existence in the community. Besides being used as a composition in traditional ceremonies, sugar cane is also the basic ingredient in sugar making and one of the consumption crops; therefore, no special and intensive conservation is needed for this plant. It is just that the knowledge possessed by the community regarding the benefits of sugar cane in traditional ceremonies needs to be continuously informed and better preserved. Sugarcane cannot grow optimally in dry areas with infertile soil; this will affect the growth and quality of the sugarcane produced. Not everyone knows how to properly care for sugarcane plants, so the right skills are needed to preserve sugarcane plants.

In conclusion this study highlights the ongoing cultural significance of sugarcane in Surakarta's traditional ceremonies, with seven sugarcane varieties identified: *tebu wulung/ireng*, *tebu raja*, *tebu kuning*, *tebu arjuno*, *tebu tiying*, *tebu hijau*, and *tebu batu*. Five varieties are actively utilized across 10 traditional rituals. The variety with the highest Use Value (UV) is *tebu wulung/ireng* (UV = 0.10), used in six different rituals and symbolizing spiritual protection, steadiness of heart, and resilience. Other varieties, such as *tebu hijau* (UV = 0.017), *tebu kuning* (UV = 0.017), *tebu arjuno* (UV = 0.017), and *tebu raja* (UV = 0.017), play more specialized roles in specific rituals. Despite the changes in ritual practices due to modernization, efforts to preserve traditional knowledge remain strong. This study underscores the importance of biocultural resilience and calls for integrated conservation strategies that combine cultural heritage with sustainable biodiversity management, ensuring that sugarcane

continues to play a vital role in Surakarta's rituals and ceremonies for future generations.

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