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Foods for the Gods: Exploring the role of foods as ceremonial and religious offerings in the island of Bali, Indonesia

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Abstract

Bali, the only Hindu-majority province in Muslim-majority Indonesia, has a unique tradition strongly founded on religious and spiritual values. The importance of religion among Balinese is reflected in various religious ceremonies, during which are presented beautiful and colorful offerings made of local crops and Balinese ethnic foods. This review aims to explore the use of food as offering in Balinese religious ceremonies, as well as its philosophical values. Fruits, traditional cakes (*sanganan* or *jaja*), and Balinese traditional cuisine are incorporated in numerous kinds of Balinese offerings, including *canang sari, jotan (saiban),* and *penjor*. Even though each offering has its unique characteristic and the same food might contribute to different values in different types of offerings, the use of food in religious offerings is in general an expression of gratitude and an action of giving back to nature and the gods. The elements of an offering are carefully arranged to represent certain philosophical values or specific God manifestations in Balinese Hinduism known as *Nawa Dewata*, the nine names of God manifestations ruling in the nine different directions. Some food offerings are also presented to the demons. In Bali, food is strongly intertwined with faith and culture. Therefore, studying the use and the value of food in Balinese ceremonial offerings would help to understand Balinese culture and tradition in a thorough manner.

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1. Introduction

Bali (Figure 1) is a province of Indonesia located between the Java and Lombok islands. The island of Bali spans approximately 153 km east to west and 112 km north to south with a total surface area of 5,780 km^2 (1) and total population of 4.32 million people in 2020 (2). Bali is Indonesia's main tourist destination, with tourism-related business making up 80% of its economy (3). Prior to the Covid-19 pandemic, in 2018, Bali was listed among the top 20 world tourist destinations (4) with 9.8 million domestic tourists and 6.1 million international tourists (5). Severely impacted due to the country lockdown policy during the pandemic, Bali was reopened for international tourism in October 2021 (6). Since its reopening, the tourism industries/activities in Bali have gradually recovered and the number of tourists visiting Bali has reached 1 million in May 2022 (7).

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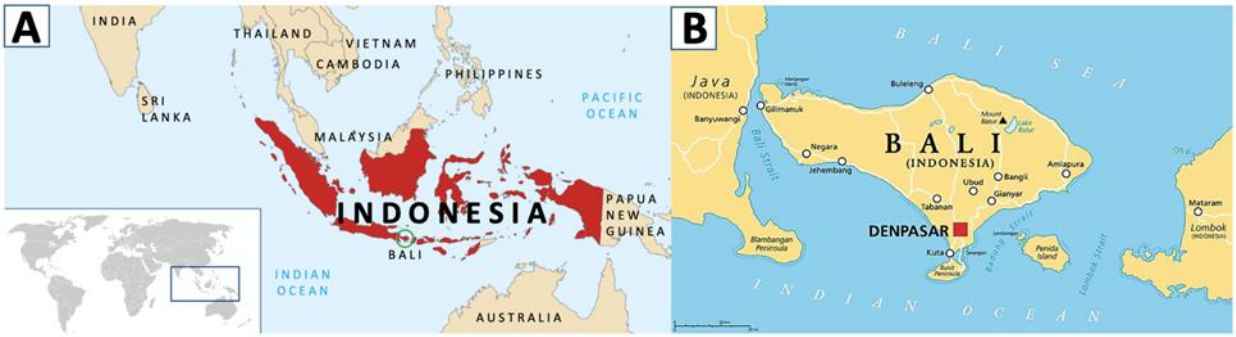

Figure 1. (A) Map of Indonesia (filled with red) with the Province of Bali indicated by the green circle. (B) Map of Bali located between Java and Lombok Island.

Bali, with almost 87% of the population adhering to Balinese Hinduism, is the only Hindu-majority province among the 37 official provinces in Indonesia (8) mostly populated by Muslims (9). At national level, among 270.2 million Indonesians recorded in 2020, 86.9% are Muslim while only 1.7% are Hindu, most of which are Balinese (10). It is noteworthy that Balinese Hinduism is very different from Indian Hinduism considered as the original form of Hinduism. Experts in Balinese culture suggested that Balinese Hinduism is a cult of ancestors embellished with a cult of nature on which are superimposed Hindu teachings inherited from the ancient Hindu kingdoms originating in Java from the 4th to the 15th century (11). Therefore, Balinese Hinduism is unique and can only be found in Bali. Hindu Balinese believe in one supreme God called Sang Hyang Widhi Wasa (12). All other gods are manifestations of this supreme being, including the *Trimurti*, the three supreme divinities in classic Hinduism consisting of Brahma the creator, Vishnu the preserver, and Shiva the destroyer (13).

Balinese people embrace the traditional philosophy of life known as *Tri Hita Karana* or the three causes of well-being: harmony with God, harmony among people, and harmony with nature (14). Such a philosophy guides many aspects of Balinese life. The harmony with God is manifested in numerous ceremonies and offerings to appease deities. The harmony among human beings is promoted through communal cooperation practice known as gotong royong and supporting compassion. The harmony with nature is concretized by conserving the nature and promoting the sustainability and balance of the environment. Indeed, religious ceremonies play a quintessential part in Balinese life since it is the perfect embodiment of the principle of *Tri Hita Karana*. To hold religious ceremonies is considered as a noble act involving people and sacred offerings coming from the nature (15). Various religious ceremonies are constantly held in Bali involving different kinds of offerings that are rich in philosophy and symbolism.

In Bali, local crops and traditional cuisine play a pivotal role in religion, ritual, and society. Local crops are considered to be gifts from the God that deserve gratitude and therefore, they should be dedicated to the God as offerings. Balinese people cook in order to eat as well as to honor and serve their God Traditional and religious values are incorporated into Balinese traditional food. Thus, Balinese food is inextricably intertwined with faith and has become an integral part of offerings presented in Balinese ceremonies. Indeed, for the Balinese, the preparation of ceremonial food and offerings is, in itself, an act of worshipping and honoring the God (15). This review aims to explore the role of food as offering in Balinese religious ceremonies, as well as its philosophical values. This is the first international review focusing on the food culture of Bali and the religious values of Balinese traditional food that are integrated in the ceremonial offerings.

2. Methodology

This literature review synthesizes research on the philosophical value and ritualistic use of Balinese food offerings. Literature was retrieved from three primary scientific databases: Google Scholar, Scopus, and ScienceDirect. The search was performed using combinations of the following keywords: ("Balinese food" or "Bali cuisine" or "Balinese offering" or "*banten* Bali" or "*canang sari*" or "*jaja* Bali") and ("culture" or "ceremony" or "symbolism" or "nutrition" or "processing"). In addition to peer-reviewed sources, relevant grey literature including official websites, cultural portals, and reputable media sources was also included. The inclusion of these sources was necessary due to the limited availability of peer-reviewed publications addressing detailed ritual practices and local cultural knowledge.

The inclusion criteria were: (i) peer-reviewed journal articles, books, conference proceedings, and credible grey literature; (ii) sources discussing Balinese food, ritual offerings, or related cultural practices; (iii) publications in English, Indonesian, or French, and (iv) publications between 2000-2024. The exclusion criteria included: (i) non-credible sources without clear authorship or institutional backing; (ii) materials not directly relevant to food, ritual, or Balinese cultural practices; and (iii) duplicate records across databases.

3. Ceremonies in Bali

Bali is renowned for its bright and richly cultural ceremonies that are believed to be media for communication between humans and the God. All ceremonies in Bali are related to religious intentions and root from ancient Balinese and Hindu philosophy. They also involve different kinds of offerings. Indeed, Balinese ceremonies are quite complex to be fully understood since different villages might have their own customs regarding ceremonies and there are also some ceremonies that are unique to certain Balinese villages.

Galungan and *Kuningan* are the biggest feasts and most important ceremonies in Bali celebrated by all Hindu Balinese. They commemorate the triumph of good *(dharma)* over evil *(adharma)*. *Galungan* is celebrated on the 11th week of the 210-day Balinese *pawukon* calendar (16) and marks the time when ancestral spirits visit the earth. For some people, *Galungan* may resemble the *Día de Muertos* (Day of the Dead) in Mexico (17). The spirits of the deceased relatives return to visit their former homes and the current inhabitants are expected to welcome them and be hospitable through prayers and offerings. The notable characteristic of *Galungan* celebration is the installation of tall and curved bamboo poles adorned with decorations and offerings known as *penjor* (Figure 2A) by the side of the roads (18). During the three days preceding *Galungan*, Balinese people would focus on preparing different kinds of traditional food to be used as offerings, including ripening bananas on *Penyekeban* Day (three days before *Galungan*), making rice cakes or *jaja* on *Penyajaan* Day (two days before *Galungan*), and slaughtering pigs and chickens on *Penampahan* Day (one day before *Galungan*). On the *Manis Galungan* (Sweet *Galungan*) Day celebrated on the day after *Galungan*, Balinese families would visit their relatives and hold family celebrations. *Galungan* celebration in Bali culminates in *Kuningan* Day celebrated on the 10th day, when the ancestral spirits leave earth and return. The day following the *Kuningan* Day is called the *Manis Kuningan* (Sweet *Kuningan*) Day celebrated through feasts, music, dance, and other fun activities (19).

Figure 2. Overview of traditional ceremonies in Bali. (A) *Penjors* installed on the side of Balinese roads during *Galungan* and *Kuningan* celebrations. (B) Parade of *ogoh-ogoh*, demonic statues symbolizing malevolent spirits in Bali held on the day before *Nyepi* Day. (C) Balinese women carrying *gebogans*, offerings consisting of piles of fruits and traditional cakes during the temple celebration day known as *odalan*. (D) *Tumpek kandang* ceremony consisting in decorating and praying for animals. (E) *Metatah* or *mepandes*, tooth filing ceremony performed on the top front six teeth of Balinese teenagers representing evil human characteristics. (F) *Ngaben*, traditional Balinese cremation ceremony held to release the soul of the dead for reincarnation. Images were adapted from (101-103).

Nyepi, commemorated on the Saka new year according to the Balinese calendar, is a day of silence, fasting, and meditation for all Hindu Balinese (20). As *Nyepi* Day is reserved for self-reflection, many restrictions are imposed for activities that might interfere and disturb such a purpose for a whole day. *Nyepi* rituals are performed by following four directions: no fire or light or electricity *(amati geni)*, no working *(amati karya)*, no travelling *(amati lelunganan)*, and no self-entertainment *(amati lelanguan)* (21). During *Nyepi*, all shops and markets are closed, even no one is allowed onto the beaches or streets. One day prior to *Nyepi*, a special ritual called *mecaru* is held to vanquish the negative elements by parading and burning *ogoh-ogoh* (Figure 2B), demonic statues symbolizing malevolent spirits from Balinese Hindu mythology (22).

Odalan is a Balinese village temple festival that marks the founding of a particular temple (23). Simply, it is known as temple's anniversary. Since Bali has over 10,000 temples, several *odalan* ceremonies are held in some part of Bali on daily basis. An *odalan* usually lasts for three days and consists of cultural events, such as musical and dance performances by local groups in the temple. It is the event during which people gather and celebrate together. In preparation for *odalan*, the temple is decorated in colorful golden cloths and beautiful ornaments. The major highlight of the *odalan* procession includes the creation of special offerings called *gebogan* (24) consisting of a pile of fruits and traditional cakes carried by a group of Balinese women on their heads while walking to the temple (Figure 2C).

There are ceremonies held to worship certain God manifestations. Saraswati Day is the day for worshipping Goddess Saraswati, the goddess of art, knowledge, wisdom, and learning. Usually, Saraswati Day is celebrated by praying, singing holy songs, dancing traditional dances, and offering books in the homes, schools, or offices (25). Four days after the Saraswati Day, a ceremony called *Pagerwesi* is held in the middle of the night to strengthen souls against evil forces (25). *Siwa Ratri*, also known as the night of Shiva, is a

ceremony dedicated to God Shiva. It is celebrated by fasting, meditating, and praying to ask God Shiva for strength and forgiveness all night long (26).

Several other ceremonies are performed to express gratitude towards nature and ask for blessings. *Tumpek uduh* is a celebration devoted to God Sangkara, the god of plants and lord of all food (27). *Tumpek kandang* is the celebration of animals during which the god of animals, God Rare Angon is worshipped (28). *Tumpek landep* is a blessing ceremony of objects that are made of metal (keris–Indonesian traditional weapon, cars, motorbikes, televisions, computers, machines, etc) (29). During these very ceremonies, trees, animals, and metal objects are decorated with traditional Balinese fabrics and offerings (Figure 2D). Religious and cultural festivals are also held on regular basis to celebrate new moon and full moon since these monthly events are believed to be sacred and provide strong cosmic energies (30,31).

Balinese people also hold ceremonies to celebrate each cycle of life. *Magedong-gedongan* is a ritual performed when the baby is still in the mother's womb (32). The ceremony serves not only to protect the unborn child from the unseen supernatural evil, but also to ask for blessings so that the baby is born healthy, intelligent, and grows up to be a good, honest, and respectful human being. When the baby is finally born, the family would do a ritual consisting of inserting the placenta in a coconut shell and planting it in front of the family's house. Different ceremonies are also conducted as the baby grows, such as *kepus pungsed* (1 week old), *ngerorasin* (12 days old), *tutug kambuhan* (42 days old), and *ngotonin* (6 months old) (32). *Ngraja swala* is a ceremony performed to celebrate the transition of boys and girls into adolescents, usually at the age of 14-15 years old (32). A unique celebration namely *mepandes* or *metatah* (tooth filing ceremony) is performed by filing crosswise the tips of the top front six teeth (four incisors and two canines) so that the teeth are even (Figure 2E). These six teeth represent six evil human characteristics known as *sad ripu* that include greed, anger, must, stupidity, jealousy, and ill-will (33). Balinese traditional marriage is a festive cultural ceremony that can take place for several days (34). Upon someone's death, Balinese people hold a big ceremony called *ngaben* or cremation ceremony (Figure 2F) believed to release the soul of the dead person so that it can enter the upper realm where it can wait to be reincarnated or liberated from the cycle of rebirths (35). Reincarnation is a Hindu religious concept that the non-physical essence of a living being begins a new life in a different physical form of body after biological death (36). It is noteworthy that in Bali, all religious ceremonies are considered as joyous occasions, including *ngaben*.

4. Food culture and traditional cuisine of Bali

Being the only Hindu-majority province in a country dominated by Muslims, the food culture of Bali is somewhat distinct with other provinces in Indonesia (15). Balinese cuisine often includes pork that is considered as *haram* (forbidden) in Islam (37). However, beef is rarely consumed since cows are considered as sacred animals by Hindu believers (38). It is interesting to note that even though it is not considered as a common daily practice, some Balinese consume beef. Among the four main categories of the Hindu caste system: *Brahmins* (priests and religious figures), *Kshatriyas* (warriors), *Vaishyas* (merchants and farmers), and *Sudras* (unskilled workers) (39), only people of the *Brahmins* and the *Kshatriyas*, the two highest social groups in the Hindu society, are not allowed to consume beef according to the Balinese Hindu teachings (40). Balinese cuisine demonstrates indigenous traditions and is influenced by other Indonesian regional cuisine (mostly Javanese cuisine), Chinese, and Indian (15).

Rice, the staple food of the Balinese, is the most important element in the Balinese food culture. In Bali, rice is widely cultivated throughout the island and steamed rice is commonly consumed in every meal. The Balinese believe that rice is a gift from Goddess Sri, the goddess of agriculture and rice widely worshipped and beloved on the island (15). Bali has a strong historical rice agriculture tradition in Indonesia, as evidenced through the *subak* irrigation system that has been implemented in Balinese paddy fields since the 9th century (41) and has been recognized as a UNESCO's World Heritage Site since 2012 (42). The *subak* system consists of the Balinese water temples regulating the water allocation for each rice field in the region (41).

Balinese cuisine is rich in spices for seasonings. *Basa gede* or *basa rajang*, also known as Balinese spices, is a mixture of spices generally used in many Balinese dishes. Its ingredients include red chili pepper, garlic, shallot, ginger, nutmeg, turmeric, cumin, palm sugar, fermented shrimp paste *(terasi)*, and Indonesian bay leaves or *salam (Syzygium polyanthum)* (15). Other commonly used spices include lemongrass, cinnamon, galangal, clove, cardamom, candlenut, and tamarind (15). Spices in Balinese cuisine are also present in the form of *sambal*, a traditional Indonesian paste or relish made from red chili peppers and other herbs and spices (43).

Figure 3 demonstrates different well-known Balinese cuisine. *Lawar* (Figure 3A) is a ubiquitous Balinese dish served almost in every meal. It consists of mixture of vegetables, grated coconut, and minced meat with herbs and spices (15). *Betutu* (Figure 3B) is a roasted poultry dish (chicken or duck) in rich spice mix made from shallot, garlic, ginger, turmeric, galangal, candle nut, chili pepper, shrimp paste, and peanut (15). *Babi guling* or roasted suckling pig (Figure 3C) is a famous pork dish made from a whole suckling pig roasted on a rotating spit (15). *Soto babi* is a spicy pork soup served with rice and various vegetables (15). *Sate babi* (pork skewers) and *sate lilit* (Figure 3D) are common grilled foods found in Balinese restaurants and eateries (15). While *sate babi* is made from diced pork arranged using wooden skewers, *sate lilit* is made from minced meat pressed onto skewers or whole lemongrass. *Mujair nyat-nyat* (Figure 3E) is a fish dish made from Mozambique tilapia *(Oreochromis mossambicus)* cooked in Balinese spices (44). *Nasi campur* (mixed rice, Figure 3F) and *nasi jinggo* are rice served with various traditional dishes (45). Sambal *matah* (Figure 3G) made from red chili pepper, shallot, lemongrass, and lime juice is a popular condiment usually present with any Balinese cuisine (43). Indonesian traditional foods made from fermented soybeans, such as tofu, tempeh, and *oncom* are also widely consumed in Balinese daily diet (46). With regard to traditional beverages, *kopi luwak* or civet coffee (Figure 3H) is the most well-known and expensive coffee made from partially digested coffee cherries which have been eaten and defecated by the Asian palm civet *(Paradoxurus hermaphroditus)* (47). Some traditional alcoholic beverages are also available and widely consumed by the local Balinese, including *arak*, *tuak*, and *brem*. *Arak* and *tuak* are made from fermented coconut palm flower sap. While *arak* contains 40-50% alcohol, *tuak* only contains 8% alcohol (48). *Brem* is made by fermenting white and black glutinous rice (48).

Figure 3. Some famous Balinese traditional food: (A) *lawar,* mixture of vegetables, grated coconut, and minced meat with herbs and spices, (B) *betutu*, roasted chicken or duck in rich Balinese spice mix, (C) *babi guling*, roasted suckling pig, (D) *sate lili*t, grilled minced meat pressed onto skewers or whole lemongrass, (E) *mujair nyat-nyat*, fish dish made from Mozambique tilapia cooked in Balinese spices, (F) *nasi campur* Bali, complete rice dish accompanied by small portions of a number of other traditional dishes, (G) *sambal matah*, popular condiment made from red chili pepper, shallot, lemongrass, and lime juice, and (H) *kopi luwak* or civet coffee, traditional beverage extracted from partially digested coffee cherries which have been eaten and defecated by Asian palm civet. Images were adapted from (104-107).

The tradition of eating together is known as *megibung* in Bali (49). It is an activity of enjoying and sharing traditional meal carried out by some people sitting together on the ground in a circular form (Figure 4). The food, consisting of different kinds of Balinese traditional cuisine, is placed on banana leaves and is shared in the middle of the participants who take and eat the food using their bare hand. Such a culture is also found in the Indian way of eating with hand that is believed to not only feed the body, but also feed the mind and spirit (50). Historically, the tradition of *megibung* was originally practiced by the knights of Karangasem Kingdom in the eastern part of Bali in the 17th century during the war (49). Such a practice was initially performed to gather the knights and count their exact number in addition to increasing the solidarity among them (49). Until present, *megibung* is an important part of the food culture in Bali and is a coveted activity during public celebrations.

Figure 4. *Megibung,* the tradition of communal eating in Bali. Image was adapted from (108).

5. Foods as offerings in Balinese tradition

A passage in the holy Hindu scripture *Bhagavad-Gita* (The Song by God) containing verses of dialogue between God Arjuna and God Khrisna clearly describes God's expectation from an offering: "whosoever offers to me with devotion a leaf, a flower, a fruit, or some water, that offering of love, of the pure heart I accept" (IX.26) (51). This message dwells at the heart of every Balinese throughout the island and is well executed by them in their daily life. Today, there are many varieties of offerings can be found in Bali, from the simple to the extravagant ones, each of which must consist of all the components that have been specified by Krishna. In Bali, offerings are presented for many reasons, including expressing gratitude, asking the gods for a favor, cleansing soul from negative energies, expressing regret, and sanctifying goods or soul (52).

In Balinese language, an offering is called *upakara*, *banten*, or *yadnya*. With regard to the latter, the importance of offering in Balinese culture roots from the principle of *panca yadnya* (literally translated into the five holy offerings) consisting of *dewa yadnya* (offering to the gods), *pitra yadnya* (offering to the ancestral spirits), *rsi yadnya* (offering to religious leaders), *manusa yadnya* (offering to other humans), and *bhuta yadnya* (offering to the demons) (53). Indeed, different ceremonies are organized in Bali on regular basis to fulfill the obligation of *panca yadnya*. For example, ceremonies on *Galungan*, *Kuningan*, and Saraswati Day are considered as *dewa yadnya* while the cremation ceremony *(ngaben)* is considered as *pitra yadnya* (53).

A typical Balinese offering would consist of at least four basic elements: fire (usually represented by incense), water (usually represented by splashes of holy water obtained from holy spring or temple), flower (symbolizes purity and deities), and food (symbolizes the concrete act of offering: giving food that is needed by the human body for living to the gods) (51). According to Balinese religious philosophy, food in the nature actually belonging, by essence, to the dwellers of the intangible world *(niskala)* consisting of the God and the demons. It ensures that what people eat is only the tangible *(sekala)* leftovers. Taking precedence over such spirits is considered as an act of "stealing" food and could therefore entail unexpected woes to those infringing the taboo (54). For such reason, Balinese make daily offerings from food they prepare for daily consumption. Once an offering has been presented, it is said to be directly consumed by the God and its manifestations and demons to which it was presented. Thus, the offering loses its essence and sacredness, becoming the preferred food of chicken, stray dogs, birds, ants, etc (15).

The items used in the Balinese offerings should come from nature and be used in daily life. It is a beautiful act of thanking the nature for blessing and nourishing humans. Behind such an action, resides a philosophical value of being grateful and not selfish. People should realize that it is the mother nature who raises and takes care of them and as an act of filial piety, one should thank the mother nature by giving her offerings. It is also the concrete representation of karma, the concept in Hinduism about beneficial experience coming from past beneficial actions and harmful effects coming from past harmful actions (55). An offering cannot be presented to the gods more than once. In most cases, offerings are not allowed to be consumed by humans after being prayed since they have been dedicated to the nature. However, there are some offerings that are shared to humans after being prayed, such as *gebogan* presented during the *odalan* ceremony (Figure 2C). In this case, the prayers and dedication are considered as an act of blessing the food and people believe that consuming blessed food would give them health and luck.

Balinese people believe that the offerings should be made beautiful to delight the gods that will in turn grant their wishes (56). Interestingly, not all offerings are dedicated to the God and its manifestations. Some offerings are dedicated to the evil spirits or demons (57). Balinese respect the principle of balance and harmony of living, as reflected in the philosophy of *Tri Hita Karana* and the concept of duality known as *rwabhinneda* (51). The latter is similar to the concept of yin and yang originating from Confucianism in East Asian countries such as China, Japan, and Korea (58). Thus, offerings are presented to the God for blessings and also to the demons to satisfy and incite them to not disturb humans or cause any unfortunate events. Generally, the offerings for the God are presented on a higher platform while the offerings for the demons are laid down on the ground (59).

Due to their vibrant colors and beautiful appearance, fruits and flowers are commonly present in all kinds of Balinese offerings. Some local fruits that are commonly used as ceremonial offerings are presented in Table 1. A Balinese offering consists of different elements, each of which represents a specific God manifestation. Balinese people uphold and respect *Nawa Dewata*, the nine God manifestations ruling in each direction of the wind in the concept of Balinese Hinduism (13). These God manifestations are Vishnu ruling in the north, Sambhu ruling in the north east, Iswara ruling in the east, Mahesora ruling in the south east, Brahma ruling in the south, Rudra ruling in the south west, Mahadewa ruling in the west, Sangkara ruling in the north west, and Shiva ruling in the center (Figure 5A). These nine God's manifestations are then attributed to nine different colors. Therefore, fruits and flowers used in ceremonial offerings are mainly chosen according to their colors to represent these God manifestations (Table 2). The position of each element should also respect the directions represented by each God according to the concept of *Nawa Dewata*. In practice, only the five main directions (north, east, south, west, and center) are usually represented in Balinese offerings in their respective color (black, white, red, yellow, and mixed color) (Figure 5B). Such philosophy resembles the philosophy of the five elements (wood, fire, earth, water, and metal) incorporated in Korean traditional cuisine (60).

Table 1. Local fruits in Bali that are often used as ceremonial offerings.

No.	Local name	Name in English
1	*Alpukat*	Avocado
2	*Anggur*	Grape
3	*Apel*	Apple
4	*Belimbing*	Carambola, star fruit
5	*Buah naga*	Pitaya, dragon fruit
6	*Bidara*	Indian jujube, Chinese date
7	*Buni*	Bignay, Chinese-laurel, wild cherry
8	*Ceremai*	Gooseberry
9	*Delima*	Pomegranate
10	*Dewandaru*	Cayenne cherry, pitanga
11	*Duku*	Langsat, lanzones
12	*Durian*	Durian
13	*Gowok, kepa*	-
14	*Jamblang*	Java plum, Malabar plum
15	*Jambu air*	Wax apple, Java apple
16	*Jambu biji*	Guava
17	*Jeruk*	Orange
18	*Jeruk Bali*	Pomelo

No.	Local name	Name in English
19	*Kecapi*	Sentul, santol, kecapi
20	*Kedondong*	June plum, golden apple, ambarella
21	*Kesemek*	Oriental persimmon, kaki persimmon
22	*Leci*	Lychee
23	*Mangga*	Mango
24	*Manggis*	Mangosteen
25	*Markisa*	Passion fruit
26	*Melon*	Melon
27	*Menteng*	-
28	*Mundu*	-
29	*Nangka*	Jackfruit
30	*Nenas*	Pineapple
31	*Pepaya*	Papaya
32	*Pir*	Pear
33	*Pisang*	Banana
34	*Rambutan*	Rambutan
35	*Salak*	Snake fruit
36	*Sawo*	Sapodilla, sapote, naseberry, chicle
37	*Semangka*	Watermelon
38	*Sirsak*	Soursop
39	*Serikaya*	Sugar apple, sweetsop
40	*Terong Belanda*	Tamarillo

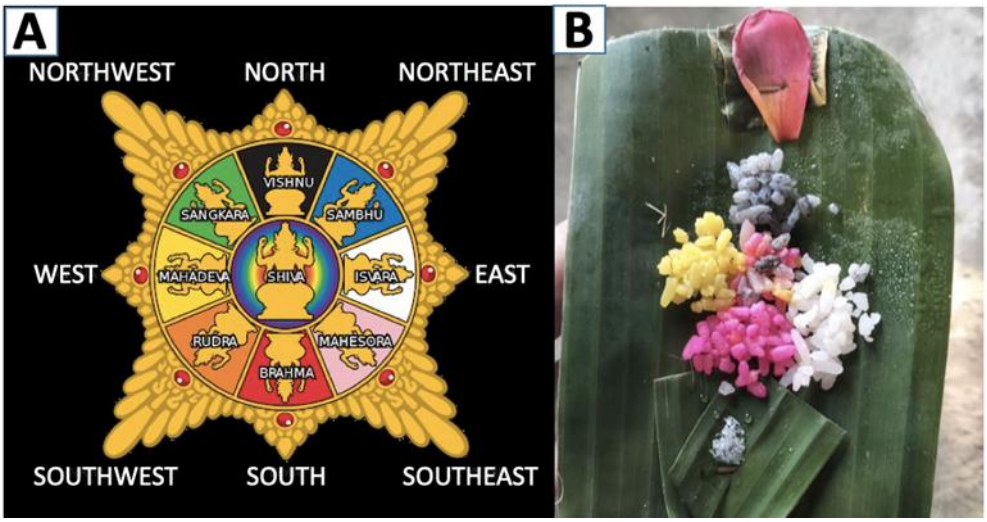

Figure 5. (A) Illustration of *Nawa Dewata*, the concept in Balinese Hinduism of the nine protector gods ruling in the nine directions of the wind. Each god is represented with a specific direction and color. Image was adapted from (109). (B) *Segehan panca warna*, an example of Balinese traditional offering consisting of rice grains of different colors meticulously arranged according to the five main directions (north, east, south, west, and center) in *Nawa Dewata*. Image was taken by the authors.

Table 2. Implementation of the concept of *Nawa Dewata* in choosing fruits and flowers for offering ingredients.

Direction	God	Color	Fruit	Flower
North	Vishnu	Black	Snake fruit, sapodilla	Blue hydrangea*
Northeast	Sambhu	Blue/purple	Mangosteen, purple grape	Blue hydrangea, butterfly pea
East	Ishvara	White	Gooseberry, *duku*	White frangipani, jasmine
Southeast	Mahesora	Pink	Dragon fruit, lychee	Pink frangipani, pink rose
South	Brahma	Red	Red apple, rambutan, pomegranate	Red rose, red bougainvillea, hibiscus
Southwest	Rudra	Orange	Orange, passion fruit, kaki persimmon	Marigold, orange balsam
West	Mahadeva	Yellow	Banana, jackfruit, star fruit	Cananga, ylang-ylang
Northwest	Sangkara	Green	Green apple, mango, June plum	Chopped pandan leaves

*) Blue hydrangea is chosen to represent the north direction and God Vishnu since black flowers are rare to find in Bali

Balinese traditional foods are often used as sacred ritual offerings in Bali. Balinese people believe certain foodstuff would please certain deities. For instance, ducks are favored by God Brahma while pork is favored by God Batara Kala, the god of the underworld (61). *Lawar* made for offering is present in different color. *Lawar merah* (red *lawar*) is made from blood and meat, *lawar putih* (white *lawar*) is made from coconut meat, *lawar kuning* (yellow *lawar*) is made by mixing red *lawar* with white *lawar*, and *lawar hijau* (green *lawar*) is made from peanut leaves (15). *Lawar capung* made from dragonflies is prepared for family ceremonies, particularly for the six-month baby ceremony (15). Other Balinese traditional foods such as *bebek betutu* (roasted duck) and *babi guling* (suckling pig) are widely used as offerings in ceremonies (15). *Nasi kuning* (yellow rice) made by adding coconut milk and turmeric extract during rice cooking is a particular dish consumed during the celebration of *Kuningan* and Saraswati Day (62,63). *Ketupat* or *tipat*, a rice cake packed inside a diamond-shaped container of woven palm leaf pouch (64), is part of the offering during the *Kuningan* festive celebration (65) and the traditional *tipat* war procession (66). Certain rare foodstuff such as turtle meat is also used in traditional rituals (67). Traditionally, Balinese people believe that preparing food as offering for ceremonies allows them to gain good karma (15). Balinese offerings take different forms according to the ritual context, ingredients used, and symbolic purpose. Several of the principal food- and offering-related forms discussed in this review are illustrated in Figure 6, while the main local terms used in the following sections are summarized in Table 3.

Figure 6. Some examples of Balinese traditional offerings: (A) *canang sari*, (B) *jotan (saiban)*, and (C) *gebogan*. Images were adapted from (110-111).

Table 3. Glossary of Balinese food- and offering-related terms, primary ingredients, and common processing methods.

Local term	Short explanation	Primary ingredients	Main processing method	Typical ritual context
Jaja/sanganan	General term for Balinese traditional cakes used for daily consumption and offerings	Rice flour, glutinous rice flour, coconut, palm sugar	Steaming, frying, molding	*Galungan, Kuningan, Saraswati*, household offerings
Jaja uli	Sticky cake symbolizing joy and gratitude	Glutinous rice, grated coconut	Steaming/pressing	Ceremonial cakes and offering trays
Jaja begina	Fried rice cake; often symbolic in offerings	Glutinous rice flour or cooked glutinous rice	Deep-frying	Galungan/Kuningan-related offerings
Jotan/saiban	Small daily food offering prepared from household meals	Rice plus side dishes, salt, vegetables, fish or meat	Cooked family food portioned into leaf tray	Daily domestic offerings
Gebogan	Tower-like offering arrangement of foods carried to temples	Fruits, jaja, decorative leaves and flowers	Assembly rather than cooking	Odalan and major temple ceremonies
Canang sari	Small daily palm-leaf offering with flowers and symbolic components	Palm leaf tray, flowers, rice, small snacks	Assembly	Daily devotional offering
Banten	Ceremonial meat dish prepared specifically for offerings	Pork, duck, chicken, spices	Boiling, roasting, grilling, stewing	Major ritual offerings
Lawar	Mixed dish of vegetables, coconut, meat, and spices; may appear in offerings	Vegetables, grated coconut, minced meat, spices	Mixing after cooking / seasoning	Daily food and ritual use
Tipat / ketupat	Compressed rice cake in woven palm pouch	Rice	Boiling	Kuningan and tipat war traditions

5.1. Canang sari

Canang sari (Figure 6A) is the most ubiquitous offering found in Bali. It is a small plate made of palm leaves formed in square that is filled with colorful flowers, finely sliced pandan *(Pandanus amarylliofolius)* leaves, tiny snacks/sweets, sometimes money, and a burning incense stick placed on the top of the offering. Etymologically, its name is derived from the Balinese words *canang* (a small palm-leaf basket) and *sari* (essence). The word *canang* itself

consists of two syllables from the local Kawi language: *ca* (beautiful) and *nang* (purpose), thus describing that such an offering is made based on a good intention for a good purpose (68). *Canang sari* is a daily offering made to thank Sang Hyang Widhi Wasa in praise and prayer. The prayer recited while offering a *canang sari* consists in a devotional statement to God and a wish for peace and abundance in the world (68). Typically, a *canang sari* is left for one night in temples, shrines, and on the ground after it is being prayed and is replaced with a new one on the next day (69).

The core materials of canang sari include banana leaf, betel *(Piper betle)* leaf, lime, gambier *(Uncaria gambir)* leaf, tobacco, and betel nuts (51). These materials symbolize the three main Hindu deities known as *Trimurti*: Shiva is symbolized by lime, Vishnu is symbolized by betel nuts, and Brahma is symbolized by gambier leaf (51). A more sophisticated version of *canang sari* (thus considered as a more complete version of canang sari) would also comprise rice, bananas, sugarcane, cake, perfumed oil *(lengis miik)*, and perfumed powder *(boreh miik)* made from sandalwood. The rice symbolizes soul *(atma)* as the source of life created by Sang Hyang Widhi Wasa. Together, bananas, sugarcane, and cake represent the three roles of Sang Hyang Widhi Wasa as embodied by the *Trimurti*: creating, maintaining, and destroying (70). The perfumed oil is the symbol of mental serenity and self-control while the perfumed sandalwood powder represents good behaviors, which are in turn overlaid by colorful flowers representing the five main God manifestations and directions in *Nawa Dewata*: Shiva, Brahma, Vishnu, Iswara, and Mahadeva. A canang sari is often completed by placing an amount of money (coin or paper) on top of it, which is believed to make up the essence *(sari)* of the offering (69).

5.2. Jotan (saiban)

Jotan or *saiban* (Figure 6B) is a common Balinese offering consisting of a small amount of food in a minuscule tray made from a rectangle piece of banana leaf. The food itself usually the same as that prepared for family's daily consumption. It usually consists of a lump of rice, a pinch of salt and pepper, some vegetable, fish, and meat (except beef). The activity of preparing *jotan* is called *ngejot* (71). *Jotan* is presented on daily basis after cooking before anyone touches the food. It is an offering for both good and evil spirits thought to be dwelling within the house and its vicinity (59). It is also an expression of gratefulness of a family for the food they are allowed to eat on a particular day (72). The manner a *jotan* is presented varies accordingly. When presented to the gods, *jotan* is placed on tables or higher platforms while when addressed to the demons, it is put on the ground (72).

The *jotan* offering procedure is well ordered and usually strictly adhered to. The ritual starts in the most "demonic" part of the house, which is the kitchen, where animal slaughtering is often done. The *jotans* are put on the top of rice/food basket in honor of Sri, the goddess of rice; near the hearth for Brahma, the God of fire; near the sink or faucet for Vishnu, the God of water; and near the spice mortar for Shiva. From the kitchen, the ritual then shifts to the family temple, where *jotans* are placed at the head of the altars for the gods and ancestors, as well as on the ground for the demons. The presentation continues to the *penunggun karang* or *palinggih pangijeng*, a Balinese traditional elevated altar usually located in the north west or center of the complex that is built as house guardian or protector. *Jotans* are also presented in front of various buildings of the compounds and near dirty cleaning utensils, mostly brooms, believed to be the favorite place of the demons. The final

presentation of *jotan*is at the house entrance to gather the demons and make them protect the house from evil spirits looking for entering the house (59).

5.3. Gebogan

Gebogan (Figure 6C) is a type of offering in the form of a mountain or tower of foods (mostly fruits and traditional cakes) usually carried on the head of Balinese ladies walking to the temples during the *odalan* festival (Figure 2C). Its form resembling a conical mountain with a wide base and a sharp top symbolizes the vertical relationship between humans and the truly Sang Hyang Widhi Wasa (24). Carried on the head that is considered as the most sacred body part where the soul dwells, *gebogan* represents an exalted offering for the God in the sky and its long vertical structure is believed to facilitate the gods to reach the essence of the offering, as well as to impede the demons in the ground to reach and steal the essence of the offering. Philosophically, *gebogan* is a symbol of gratitude for the blessing of the Gog given through the local crops (24). The height of a *gebogan* can vary from about 50 cm to almost 2 m (73).

To make a *gebogan*, Balinese would use different kinds of local fruits, thus resulting in a colorful and beautiful offering. The fruits presented in the *gebogan* should come from the five different kinds of birth, known as *panca renga* (74). These fruits include those born from flowers (e.g. mango, apple, orange, and guava), those that only form fruits once in their life (e.g. banana), those born directly from the tree (e.g. jackfruit, durian, *duku*, and lychee), those with scaled skin (e.g. pineapple, dragon fruit, and *salak* or snake fruit), and those coming from the roots (e.g. cassava and jicama) (74). A *canang sari* is usually put at the top of a *gebogan*. Creating a *gebogan*is started by making a stable base made of wood and a pike in the center which later will be impaled by banana stem as the medium to stick and arrange all the foods using bamboo skewers (73). Other decorative elements, such as flowers and palm leaves are also used to beautify *gebogans.*

5.4. Sanganan (jaja)

Sanganan is a Balinese term used to describe Balinese traditional cakes *(jaja)* often used as offerings in ceremonies and rituals. These cakes are commonly consumed daily by Balinese people and can be easily found in traditional markets (75). *Jaja begina* (Figure 7A) and *jaja uli* (Figure 7B) are the most common ceremonial traditional cakes. *Jaja begina*, made from deep fried glutinous rice, is the symbol of knowledge. *Jaja uli* is made from glutinous rice and grated coconut. It is a symbol of joy, gratitude, and filial piety towards parents. *Jaja uli* is also present under three different colors (white, red, and brown) representing the *Trimurti* (76). Dodol (Figure 7C) and wajik (Figure 7D) made from glutinous rice and palm sugar symbolize loyalty and literature respectively (77). *Jaja sirat* (Figure 7E) and *jaja satuh* (Figure 7F) made from rice flour symbolize relationship and truth respectively (77). *Jaja reta* (Figure 7G) is made especially for religious Balinese ceremonies and has deep philosophical meanings. An example of a special *sanganan*, *jaja* Saraswati in the form of lizard (Figure 7H), is specifically made during the celebration of Saraswati Day. Austronesians believe that lizards possess the power to detect spiritual vibes (78). The philosophical value of *jaja* Saraswati is that one should develop not only their knowledge, but also their spirit to create a perfect balance of the soul (78).

Figure 7. Some Balinese traditional cakes locally known as *sanganan* or *jaja* that are widely used as ceremonial offerings: (A) *jaja begina*, (B) *jaja uli*, (C) *dodol*, (D) *wajik*, (E) *jaja sirat*, (F) *jaja satuh*, (G) *jaja reta*, and (H) *jaja* Saraswati. Images were original and taken by the authors.

Jaja sarad pulagembal (Figure 8A) is a highly artistic and sophisticated form of *sanganan* made from deep fried pre-colored rice flour. Traditionally, such a presentations arranged from different types of traditional rice cakes in a meticulous manner and depicts the creation of the world according to the Hindu mythology (79). As the representation of *rwabhinneda*, the Balinese cosmic duality concept, *jaja sarad pulagembal* (considered as a "positive" offering) is usually presented with *jatah* (Figure 8B), another artistic offering made from meat (considered as a "negative" offering) (80). At least 17 different types of Balinese traditional rice cakes are used to create a complete *jaja sarad pulagembal*. These traditional rice cakes represent different elements depicting the universe and its components: the sea, plants, animals, flowers, humans, offerings, water, time, and the gods (81).

The characteristic textures of *jaja* are strongly linked to starch transformations during processing. In starch-based systems, gelatinization occurs when starch granules are heated in the presence of sufficient water, causing disruption of their semi-crystalline structure, water uptake, swelling, loss of molecular order, and eventual formation of a softer gel-like matrix (82,83). In steamed rice- and glutinous-rice cakes, this process is promoted by moist heat, so the starch granules absorb water and swell rather than drying at the surface, which helps generate the soft, cohesive, and elastic texture expected in many ritual cakes (83,84). This mechanism helps explain why many steamed *jaja* are perceived as chewy, dense, and slightly sticky, especially when glutinous rice flour is used in high proportion. Glutinous rice is characterized by extremely low amylose and very high amylopectin content, often reported at around 98% or more of total starch, and this composition is closely associated with the soft, sticky, and chewy texture of glutinous rice products after cooking (85). Accordingly, *jaja* prepared predominantly from glutinous rice flour would be expected to show greater cohesiveness and stickiness than cakes made from ordinary rice flour.

By contrast, fried *jaja* develop a different texture because frying involves rapid heat and mass transfer at the product surface. During frying, water evaporates quickly from the outer layer, leading to dehydration, pore formation, and development of a rigid crust, which is a major structural basis for the crispy texture of fried foods (86). The reduction of surface moisture and water activity, together with crust formation, produces a more brittle and crunchy exterior than that observed in steamed products (86). Therefore, traditional fried *jaja*

can be understood as starch-based systems in which surface dehydration and crust formation dominate over the soft gel development typical of steaming.

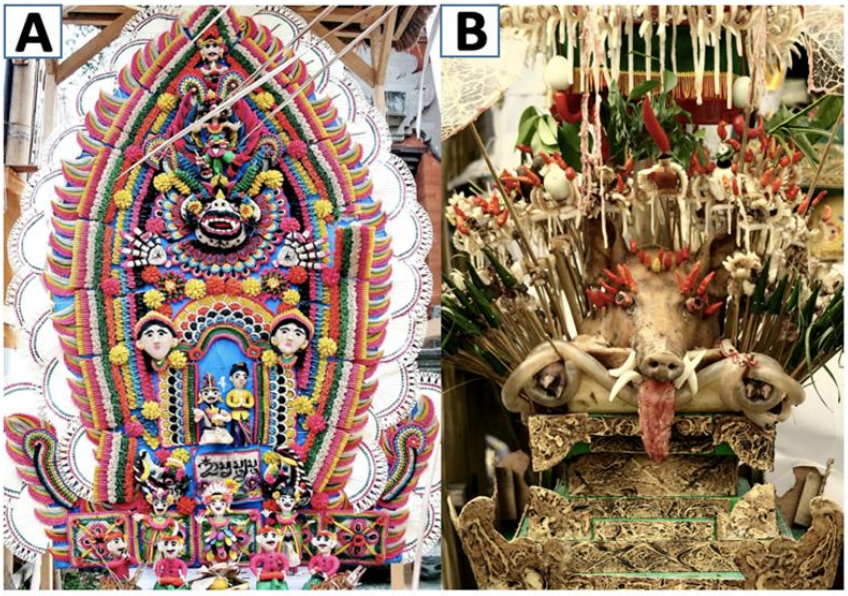

Figure 8. (A) *Jaja sarad pulagembal*, a grand and artistic arrangement of Balinese offering made from colorful traditional rice cakes and (B) *jatah*, an offering made from meat usually present with *jaja sarad pulagembal*. In accordance with the concept of duality upheld by the Balinese known as *rwabhinneda*, *jaja sarad pulagembal* is considered as a "positive offering" while *jatah* is considered as a "negative offering". Images were original and taken by the authors.

After cooking, retrogradation gradually occurs as gelatinized starch molecules reassociate during cooling and storage. Retrogradation is generally described as the reorganization of previously disordered amylose and amylopectin chains after gelatinization, and it is a major cause of firming and staling in cereal- and rice-based products (87). In practical terms, this process increases firmness, reduces flexibility, and diminishes the preferred fresh texture of rice cakes over time; high-moisture rice snacks and cakes are well known to harden during storage because of starch retrogradation and moisture redistribution (88). This helps explain why many *jaja* are considered best shortly after preparation and why their quality in ritual use is linked not only to symbolic form and color, but also to freshness and textural integrity. Although glutinous rice products are often somewhat more resistant to firming than higher-amylose systems, they are still susceptible to textural deterioration during storage as amylopectin recrystallization progresses (83).

Taken together, these observations suggest that traditional preparation methods align closely with starch science. Steaming favors gelatinization in a high-moisture environment and therefore supports the soft-chewy matrix desired in some offerings, whereas frying promotes rapid dehydration and crust formation, generating the crisp textures required in others (86). From this perspective, the desired textures of *jaja* are not merely sensory attributes, but part of the culturally expected quality of the offering, where appropriate texture contributes to the integrity, freshness, and acceptability of the ceremonial food.

5.5. Penjor

Penjor (Figure 2A) is the major offering for celebrating *Galungan* and *Kuningan*. It is a tall, curved pole of bamboo adorned with decorations placed in front of every building in Bali (18). *Penjor* is a symbol of the bounty of the earth and a thankful expression for the nature. Usually, *penjors* are prepared a week to two days before *Galungan* (18).

Considered as the most majestic Balinese offering presented on the very special day commemorating the victory of virtue against evil, *penjor* on *Galungan* Day is rife with symbolism in its every element (Figure 9 and Table 4). The height of the *penjor* represents Mount Agung, the holy volcanic mountain on the island believed to provide protection and prosperity. Its long structure represents Dragon Basuki, the serpent belonging to God Shiva that protects the earth in Hindu mythology (89). The other elements of the *penjor* symbolize the strength and holiness of deities in Balinese Hinduism, including the Ultimate *Sang Hyang Widhi Wasa* and the *Nawa Dewata*. Different kinds of foods are present in a *penjor*. Coconut represents God Rudra while sugar cane symbolizes *God Sambhu*. Various fruits *(pala gantung)* and tubers *(pala bungkah)* are hung onto penjors to symbolize God Vishnu. Balinese traditional cakes, particularly *jaja begina* and *jaja uli*, are hung on the top of a *penjor* to represent God Brahma (89)

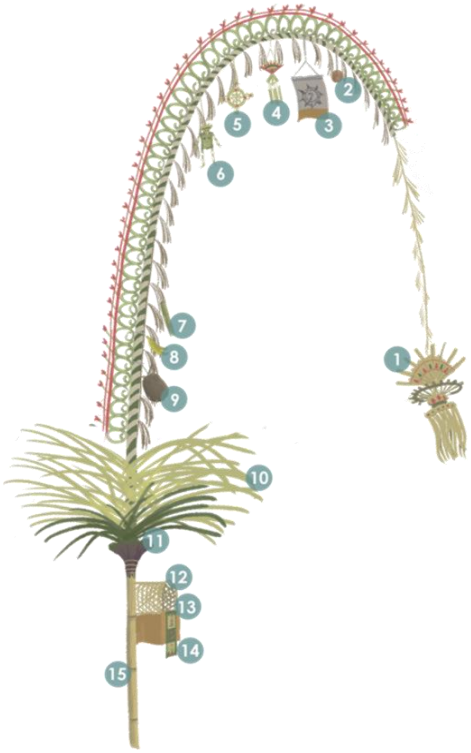

Figure 9. Elements of a *penjor*: (1) *sampian*, (2) traditional cakes *(jaja)*, (3) *kober putih kuning*, (4) *gegantungan*, (5) *tamiang*, (6) *ubag-abig*, (7) sugar cane *(tebu)*, (8) fruits *(pala gantung)* and tubers *(pala bungkah)*, (9) coconut *(nyuh)*, (10) palm leaves *(busung)* and bamboo *(ambu)*, (11) green leaves *(plawa)*, (12) *sanggah* Ardha Chandra, (13) offering *(banten)*, (14) *lamak*, and (15) bamboo *(ambu)*. Image was created by the authors

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Table 4. Elements of *penjor* and the gods symbolized.

No.	Element	Note	Symbolized god
1	*Sampian*	Decoration made of palm leaves and flowers symbolizing the tail of Dragon Basuki	Parama Shiva, embodiment of Sang Hyang Widhi Wasa
2	*Jaja*	Local Balinese cakes made from sticky rice	Brahma
3	*Kober putih kuning*	Yellow and white cloth with the Sanskrit character of *"om"*(ॐ)	Iswara, the god of arts and sciences
4	*Gegantungan*	Small decorations made from palm leaves representing angels	Widyadari (angels)
5	*Tamiang*	Decorations made from palm leaves providing protection against black magic	-
6	*Ubag-abig*	Effigies of people made of palm leaves symbolizing virtue	Rare Angon, manifestation of Shiva
7	Sugar cane *(tebu)*	-	Sambhu
8	Fruits *(pala gantung)* and tubers *(pala bungkah)*	Natural resources representing gratitude towards nature and blessings	Vishnu
9	Coconut *(nyuh)*	-	Rudra
10	Palm leaves *(busung)* and bamboo *(ambu)*	Both elements give white and yellow colors considered to be sacred	Mahadewa
11	Green leaves *(plawa)*	Arrangement of palm and banana leaves.	Sangkara
12	*Sanggah* Ardha Chandra	Woven bamboo box used as a place for offerings symbolizing the head of Dragon Basuki.	Shiva
13	Offering *(banten)*	Symbol of gratitude	Sadha Shiva, embodiment of Sang Hyang Widhi Wasa
14	*Lamak*	Tablecloth made from palm leaves knitted with bamboo sticks	Tribhuana
15	Bamboo *(ambu)*	-	Mahesora

Taken together, the ritual foods and offerings discussed above reflect substantial diversity in ingredients, preparation techniques, and ceremonial meanings. From a food science perspective, these items range from fresh and assembled offerings to steamed, boiled, fried, roasted, and mixed preparations, each of which may influence texture, perishability, and the retention of bioactive compounds. To provide an integrated overview, Table 5 cross-references the major Balinese ritual food items and offerings according to their primary processing methods, representative functional components, and symbolic roles.

6. Nutritional, safety, and standardization perspectives of Balinese ritual foods

6.1. Nutritional perspectives

Beyond their ritual and symbolic value, Balinese ceremonial foods also present important points of interest from a food science perspective. Many of these offerings are prepared from nutritionally relevant staples and plant ingredients such as rice, glutinous rice, black rice, coconut, banana, and a range of aromatic spices and herbs. Rice and glutinous rice primarily contribute carbohydrates and textural functionality, while black rice is particularly notable for its higher contents of anthocyanins, flavonoids, and phenolic acids compared with non-pigmented rice (90). Coconut, which appears in grated, fresh, or processed forms in many offerings, contributes lipids rich in medium-chain fatty acids, and coconut-based ingredients have also been associated with phenolic and antioxidant components (91). Collectively, these

ingredients suggest that Balinese ritual foods should not be viewed only as ceremonial objects, but also as complex traditional food systems with nutritional and functional relevance.

Table 5. Cross-reference of major Balinese ritual food items and offerings according to primary processing method, key bioactive ingredients, and symbolic meaning.

Food item	Primary processing method	Representative bioactive / functional components	Symbolic meaning / ritual role
Black rice preparations / colored rice components	Boiling, steaming	Anthocyanins, phenolic compounds, dietary fiber, minerals	Color symbolism; representation within *Nawa Dewata*-related offering logic
Nasi kuning/yellow rice	Boiling / steaming with turmeric and coconut milk	Curcuminoids, coconut lipids	Auspiciousness, celebration, ritual festivity
Jaja uli	Steaming and pressing	Starch (amylopectin-rich), coconut lipids and fiber	Joy, gratitude, filial respect
Jaja begina	Deep-frying	Starch matrix with reduced surface moisture	Knowledge; ceremonial cake component
Lawar	Mixing cooked ingredients with fresh spice paste	Polyphenols and essential oils from spices; coconut fiber/lipids	Offering food for specific deities; communal identity
Bebek betutu/spiced duck	Roasting / braising	Curcuminoids, gingerols, galangal phenolics, garlic sulfur compounds	Used in major ceremonies; deity-specific preference
Babi guling/pork dishes	Roasting	Spice-derived antioxidants and antimicrobials	Associated with Batara Kala and major ritual feasts
Gebogan fruits	Fresh assembly	Vitamins, phenolics, carotenoids depending on fruit	Gratitude for agricultural abundance; color-based deity representation
Canang sari snack/fruit elements	Assembly	Depends on included flowers, rice, fruit, and leaves	Daily devotion and offering essence
Penjor elements (coconut, sugar cane, fruits, *jaja*)	Assembly of raw and prepared foods	Coconut lipids; sugars; fruit phytochemicals; starch-based cakes	Thanksgiving to nature and symbolization of divine manifestations

The use of spices and herbs further strengthens the functional dimension of these foods. Culinary herbs and spices are widely recognized as important sources of polyphenols and other phytochemicals (92), and many tropical spices also contain bioactive compounds such as eugenol, cinnamaldehyde, curcumin, terpenoids, and related phenolics that have been associated with antioxidant, anti-inflammatory, and antimicrobial activities (93). In the Balinese context, ingredients such as turmeric, ginger, galangal, lemongrass, and clove therefore contribute not only aroma and flavor, but potentially also functional properties. At

the same time, the retention, release, and transformation of these compounds are strongly influenced by the way the foods are processed. Thermal treatments such as steaming and boiling may soften plant tissues and disrupt cellular structures, thereby improving extractability or release of some phytochemicals into the food matrix, but they may also accelerate degradation of heat-sensitive compounds through oxidation, hydrolysis, or thermal decomposition (94). Frying and roasting, in contrast, involve higher temperatures and lower moisture conditions, which can intensify aroma development and produce desirable sensory notes, yet may also result in greater losses of thermolabile phenolics and pigments (95). Anthocyanins are particularly heat-sensitive compounds whose stability is strongly affected by the intensity and duration of thermal processing (96), and black-rice anthocyanins are known to undergo degradation during heating and pH-dependent processing (97). Similarly, prolonged heating, repeated holding, or exposure to air during preparation may alter the concentration and activity of volatile and phenolic constituents from spices and herbs. In addition to thermal effects, mechanical processing steps such as grating, grinding, pounding, shredding, and mixing may further influence the functional profile of the offerings by increasing surface area, facilitating enzymatic reactions, and promoting interactions among starch, lipids, proteins, and phytochemicals (98). Therefore, steaming, boiling, frying, roasting, grinding, and prolonged holding do not merely create culturally desired textures and flavors, but also determine the stability, availability, and final bioactive profile of the offering foods.

6.2. Safety perspectives

Those compositional aspects are closely linked to shelf-life and safety. Many Balinese offerings are assembled or prepared in advance and then displayed for hours under ambient tropical conditions, which may increase the risk of quality deterioration and microbial growth, particularly in moist foods rich in starch, coconut, or animal-derived ingredients. This concern is especially relevant for cooked rice and rice-based preparations, since *Bacillus cereus* is a well-recognized hazard in rice and rice-derived foods when time–temperature control is inadequate (96). As reviewed by Rodrigo et al. (99), processed rice products can support the growth of *B. cereus*, and storage without refrigeration or under temperature abuse can create a risk for consumers. Similar concerns apply to mixed dishes containing shredded coconut, meat, or coconut milk, especially when these are handled extensively or held without temperature control. Therefore, although ritual foods are deeply rooted in tradition, their preparation and presentation also need to be understood within the framework of modern food hygiene.

Traditional wisdom may nevertheless contain practical elements that help moderate spoilage risk, even if these practices were not originally formulated in microbiological terms. Fresh daily preparation, small-batch production close to the time of ritual use, and rapid turnover of offerings may all help reduce the period during which foods remain susceptible to sensory spoilage or microbial proliferation. An additional culturally specific factor is that, after ritual presentation, many offerings may no longer be regarded as conventional food for human consumption. Once the ceremonial essence of the offering is believed to have been received by divine or unseen beings, the remaining material may instead be diverted to animals, discarded, or otherwise given lower priority as human food. This cultural logic may indirectly reduce exposure to deteriorated products. However, where ceremonial foods are retained for sharing or communal consumption, microbiological safety remains a relevant

concern. The inclusion of spices with antimicrobial potential may also contribute to product stability to a limited extent (93), although this should not be overstated. Such effects cannot substitute for hygienic handling, clean water, safe raw materials, and appropriate holding conditions, all of which remain central principles in modern food hygiene systems such as the Codex General Principles of Food Hygiene and HACCP-based approaches (100).

6.3. Standardization perspectives

At present, efforts surrounding Balinese traditional foods appear to be more strongly directed toward cultural preservation, culinary tourism, and heritage promotion than toward strict standardization of ritual offering recipes themselves. This is understandable because ritual foods remain closely tied to local religious practice, village-specific customs, household transmission, and ceremonial context, all of which naturally generate variation in composition, appearance, and preparation. For this reason, complete recipe standardization may not always be appropriate, since excessive formalization could diminish the ritual flexibility and local authenticity that give these foods their cultural significance. A more suitable pathway may be selective standardization, in which the symbolic identity, key ingredients, and ceremonial logic of the foods are maintained, while aspects related to hygiene, handling, storage, packaging, and hazard control are aligned with modern food safety systems such as HACCP and ISO 22000. In this regard, future efforts to document or adapt selected ritual foods for culinary tourism, education, or broader specialty markets should seek a balanced approach in which ritual authenticity and local variation are respected, while good hygiene practices and food safety management principles are incorporated to support wider dissemination and consumer protection.

Overall, Balinese ritual foods illustrate how symbolic meaning, sensory design, ingredient functionality, and safety considerations coexist within a single traditional food culture. Their scientific value lies not only in their ethnographic significance, but also in the way they integrate plant bioactives, starch-based structuring, lipid-rich coconut components, and diverse processing methods into culturally meaningful foods. A stronger food science understanding of these offerings may support future work on compositional analysis, shelf-life evaluation, standardized documentation, and the preservation of Balinese culinary heritage in forms that remain both culturally respectful and microbiologically safe.

7. Conclusions

Relationship with the intangible world is quintessential for Balinese. Therefore, religious and spiritual values are robustly upheld by Balinese and root strongly in the Balinese way of life. Balinese hold religious ceremonies on regular basis with various kinds of offerings dedicated to the gods and the demons. Local crops and traditional foods are integral part of offerings in Bali that contain rich and deep philosophical values. Their presence is essential to represent and please different God manifestations and demons. Each God manifestation is attributed to a color according to the concept of *Nawa Dewata* and therefore, Balinese offerings usually consist of colorful fruits, flowers, and traditional cakes. There are different kinds of offerings in Bali and uniquely, each kind of offering has its own characteristics and philosophy that are strongly related to Balinese religious belief. Therefore, studying the use of food in Balinese ceremonial offerings can help to understand Balinese culture and tradition in a thorough manner.

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Author Contributions

R.S. Study conception; R.S. principal author; R.S. and F.T. data collection; R.S. and F.T. manuscript writing; R.S. manuscript review and editing.

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Conflicts of Interest

The authors declared no competing interests.

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