

# In-Vitro Fermented Civet Coffee as an Alternative Coffee from the Perspective of Halal and Civet Conservation

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**Abstract:** Coffee is a highly valued economic commodity. While the export value of coffee from Indonesia is still ranked third in the world, there are several Indonesian specialty coffees that hold significant economic value. One of them is civet coffee, produced through in-vivo fermentation within the civet's body. During fermentation inside the civet's body, coffee undergoes enzymatic processes facilitated by enzymes from microorganisms and enzymes from the civet's stomach. This in-vivo fermentation process imparts a unique quality to the coffee, making it highly favored by many worldwide. Based on the concept of in-vivo enzymatic processes, it is essential to conduct in-vitro (outside the body) fermentation processes for civet coffee. This is done as an effort to standardize the quality of civet coffee and to exercise caution regarding potential contaminants or issues related to halal certification. Additionally, this approach aims to reduce the capture of civets for in-vivo fermentation processes. Furthermore, it contributes to increasing the local coffee's market value, aiming to match or surpass the specialty status of civet coffee.

**Keywords:** In-Vitro Fermentation, Civet Coffee, Halal, Civet Conservation

## INTRODUCTION

Coffee is a familiar beverage across various segments of Indonesian society. Whether in rural or urban areas, both men and women enjoy coffee. Drinking a cup of coffee is not just a matter of taste but has become a part of the Indonesian lifestyle. The proliferation of coffee shops as comfortable venues to enjoy a cup of coffee while gathering with friends or business partners is one testament to this.

Indonesia is the world's third-largest coffee producer, following Brazil and Vietnam (Kemendag, 2013). The types of coffee globally are divided into four major groups: robusta, arabica, excelsa, and liberica (Muzaifa, et al., 2006). In Indonesia, arabica and robusta are the cultivated coffee varieties (Mulato, 2018). Robusta coffee beans, in general, have higher total dissolved solids, pH, caffeine, cafeylquinic acid, and dicafeylquinic acid compared to arabica coffee.

Coffee production in Indonesia is dominated by robusta, accounting for 90%, while the remaining is arabica (Mulato, 2018). Thirty percent of coffee production is consumed domestically, with the rest exported to various countries (Wahyu & Suwandari, 2012). Coffee consumption in Indonesia reaches 1.07 kg per capita (Mulato, 2018). It is further stated that the demand for coffee for domestic consumption continues to increase by 6.3% annually (Mulato, 2018). Simultaneously, export needs persist; for example, on December 2, 2019, East Java exported coffee worth IDR 5.08 billion to Latvia and Egypt (Pos, 2019).

Coffee plantations, managed by state-owned enterprises (BUMN), private entities, and local communities, are found in various regions of Sumatra, Java, Bali, Nusa Tenggara, Sulawesi, Maluku, and Papua.

The coffee varieties cultivated in Indonesia are arabica and robusta, serving as the main varieties for coffee plantations. Arabica coffee is a traditional type, relatively small in size, green to dark red in color, and has a good taste. On the other hand, robusta coffee has a more bitter taste, slightly acidic, and contains more caffeine compared to arabica coffee (Haryati, 2008).

Initially, these two varieties were the main engines of coffee production. However, recently, processed coffee beans have been discovered to attract local and international consumers, and one such example is civet coffee.

Civet coffee is produced from coffee beans that have been eaten and passed through the digestive system of civets. Civets, scientifically known as *Paradoxurus hermaphroditus*, are mammals belonging to the civet and genet family (Viverridae). Civets are nocturnal carnivorous mammals, although, as carnivores, they also consume ripe fruits, and one of them is coffee that is fully mature (Budihardjo & Sasongko, 2013).

Coffee beans are protected by a hard shell, making them indigestible in the civet's digestive system, and they are excreted intact with civet feces. During the digestion process, coffee beans undergo a short fermentation in the civet's digestive system. Microorganisms, especially bacteria, are believed to play a role in the fermentation process in the civet's digestive system (Rahayu, Rahmawati, & Kurniatuhadi, 2018). Coffee fruit undergoes fermentation for approximately 12 hours in the civet's digestive system, which contains various enzymes, including carboxy peptidase, amino peptidase, and peptidase, enhancing the taste of coffee. This process gives civet coffee beans a unique aroma that cannot be replicated by machine-made coffee (Kemendag, 2013).

Various coffee flavors continue to be created to meet the preferences of coffee enthusiasts. Two aspects are continually developed: low caffeine content and a taste resembling civet coffee (Tika, IN, Pujani, & Agustina, 2017). This is because civet coffee has a distinctive taste, and the demand in the global market is increasing. Providing civet coffee faces technical challenges because the production process involves the digestive system of civets or coconut civets (*Paradoxurus hermaphrodites*). Civets will only eat the best, fully mature coffee fruits (Chen & al., 2008). As a result, coffee beans have a different taste after being eaten and passing through the civet's digestive system (Chen & al., 2008).

The uniqueness of civet coffee lies in its low caffeine, low acidity, low fat, and low bitterness (deBruyn & al., 2017), earning it the title of the most enjoyable coffee in the world. Additionally, civet coffee is an organic product that is safe for health and free from pesticides, chemical fertilizers, growth hormones, and genetically modified seeds (Ikhwan, 2013).

This fermentation process is one of the reasons civet coffees has a unique taste and aroma. This distinctive taste and aroma attract coffee enthusiasts, leading to increasing demand for civet coffee both locally and internationally year after year (Prayuginingsih, Santosa, Hazmi, & Rizal, 2012).

The rising demand for civet coffee from various countries, such as Germany, Japan, the United States, and other European nations, has made civet coffee producers struggle to fulfill orders. This was mentioned by the Operational Director of PTPN XII as one of the civet coffee producers (Amri, 2009). Meanwhile, the Chairman of the Indonesian Civet Coffee Farmers Association stated that the national production of civet coffee is only 200 tons per year (Amri, 2009).

Many countries worldwide, especially in Europe, Japan, and the United States, are familiar with Indonesia's specialty coffee that is on par with other specialty coffees globally (Cheong & al., 2013). Specialty coffee refers to premium-class coffee with high flavor profiles. Some well-known Indonesian specialty coffee variants globally include Java Coffee from East Java, Gayo Coffee from Aceh, Mandheling Coffee from Aceh, Toraja Coffee or Celebes Coffee from South Sulawesi, and Civet Coffee from civet fermentation. In-

ternationally, Civet Coffee from Indonesia is valued at \$600 (Canada) per pound, making it one of the rarest and most expensive coffees in the world (Marcone, 2004).

### Efforts in Civet Conservation

The continuously increasing demand has led to ongoing civet hunting, resulting in the depletion of civet populations. Consequently, the scarcity of civets (*Paradoxurus hermaphroditus*) and the limited digestive capacity of civets have restricted the production of civet coffee.

One alternative for civet coffee production is to utilize in vitro fermentation that mimics the natural fermentation process that occurs in the civet's digestive system.

Proteolytic bacteria found in civet feces belong to the genera *Bacillus* and *Proteus* (Rahmawati, 2017). However, (Hadipernata & Nugraha, 2012) isolated three bacterial strains of the genus *Lactobacillus* with the species: *Lactobacillus plantarum*, *Lactobacillus fermentum*, and *Lactobacillus Jensenii*. These bacteria are lactic acid bacteria, commonly known as BAL. Research by Munandar et al. (Munandar, Afriyanti, & Karimah, 2022) found that BAL in civet feces in Jember included *Lactobacillus plantarum*, *Lactobacillus brevis*, *Leuconostoc paramesenteroides*, *Leuconostoc mesenteroides*, and *Streptococcus faecium*.

BAL is commonly used as a starter culture in fermentation, and some of them are natural components of the microflora in the intestine (Chakraborty & Bhowal, 2015). Furthermore, it is stated that LAB, especially *Lactobacilli* and *Bifidobacteria*, are commonly used as potential probiotics that contribute to health improvement due to their therapeutic functions.

### Civet Coffee from the Halal Perspective

In Surah Al-Baqarah, verse 168, Allah commands us to consume those which are halal and good. Therefore, what about food and drinks derived from feces? Considering that we know food and drinks from feces are impure, they are deemed non-halal or haram. How does this apply to civet coffee? According to the Indonesian Ulama Council (Majelis Ulama Indonesia or MUI), civet coffee is considered *mutanajjis* or an item contaminated with impurities ((MUI)). Civet coffee is no longer impure if it meets two conditions: the coffee beans are still intact with their husks or what is commonly known as the parchment, and they can still grow if planted. If these two criteria are fulfilled, civet coffee can be categorized as halal ((MUI)).

To ensure caution regarding impurities, an in-vitro fermentation process is carried out, meaning outside the civet's body. This process utilizes bacterial isolates derived from civets (Munandar, Afriyanti, & Karimah, 2022). Fermentation is also effective in reducing caffeine content by 2.3% for arabica coffee and 2.1% for robusta coffee. While this condition indicates that arabica coffee can experience a greater reduction compared to robusta coffee, it is still higher than the natural fermentation condition of civet coffee. This decrease is attributed to the limited scope of fermentation to eliminate certain components. Physically, civet coffee is almost identical to non-civet coffee.

## CONCLUSION

Coffee, currently a booming commodity, needs to be promoted among the community, especially among students. By familiarizing themselves with coffee, including specialty coffees like civet coffee, which has a high market value, it is essential to encourage its development. However, due to the impurity concerns and the limited natural presence of civets, alternative solutions for civet coffee are necessary. One of the alternative solutions is in-vitro fermentation for coffee.

Civet coffee produced through in-vitro fermentation is considered a suitable solution because it avoids impurities and, on the other hand, reduces the capture of civets in the wild. Additionally, in-vitro fermentation for

coffee, proven to have the same flavor profile as civet coffee, creates business opportunities for the community and students in the form of small and medium-sized enterprises (SMEs).

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