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Short Communication

Antimicrobial activity of traditional wines (*Sopi* and *Moke*) against S*almonella sp.* and *Escherichia coli*

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ABSTRACT

Objective: *Sopi* and *Moke* are two traditional wines in Indonesia. The present study aimed at investigating the antimicrobial effects of *Sopi* and *Moke* as compared to other commercial disinfectants.
Materials and methods: The alcohol level and pH of the traditional wines (*Sopi* and *Moke*) were determined by alcohol meter and pH meter, respectively. The susceptibility test was perfomed to determine the antimicrobial activity of *Sopi* against *Escherichia coli* which was isolated from cattle, and the activity of *Moke* was tested against *Salmonella sp.* which was a local isolate of poultry.
Results: In susceptibility test, *Sopi* showed 17.5 mm in zone of inhibition against *E. coli*, while Formades®, a commercial disinfectant showed 16 mm of zone of inhibition against the same bacteria. *Moke* showed 17.5 mm inhibition zone against *Salmonella sp.*, whereas Antisep®, a commercial disinfectant had 28 mm of inhibition zone against the same isolate.
Conclusion: The results indicate that *Sopi* and *Moke* have antimicrobial effects on *E. coli* and *Salmonella sp.*, respectively. The findings of this study suggest that *Sopi* and *Moke* can be used as potential antimicrobial agents.

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KEYWORDS

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INTRODUCTION

Sopi and *Moke* are the local names of traditional drinks produced by indigenous people of East Nusa Tenggara, a province in the eastern of Indonesia, since a long time ago (Fox, 1977). Generally speaking, palm wines *Sopi* and *Moke* are nondistilled traditional alcoholic beverages produced by fermentation of fruit juice extracted from flowers *Borassus flabellifer* L. or Siwalan tree, a kind of palm tree grows in South and Southeast Asia (Heyne, 1987).

Numerous studies reported that alcoholic beverages, such as wine, have antimicrobial properties which inhibit the growth of undesired organisms. Weisse et al. (1995) reported that wine had antimicrobial activities on *Salmonella enteritidis*, *Shigella sonnei*, and *Escherichia coli* within 20 min. Similarly, Sugita-Konishi et al. (2001) proved that the red and white wines on *in vitro* testing, showed antibacterial activities on the growth of three specific potential enteropathogens namely *S. enteritidis*, *E. coli* O157:H7 and *Vibrio parahaemolyticus*. In supporting this, other past publications also reported the ability of wine to inhibit the growth of several species and strains of microorganisms such as *Salmonella sp.* (Just and Daeschel, 2003), *Helicobacter pylori, Staphylococcus aureus, Listeria monocytogenes, E. coli* O157:H7 and *Salmonella typhimurium* (Moretro and Daeschel, 2004), *S. sonnei* and *E. coli* (Waite and daeschel, 2007), and *Campylobacter jejuni* (Carneiro et al., 2008; Vaz, 2012). Furthermore, as per the report of Rachel and Elizabeth (2011), palm wine beverage in Nigeria had antimicrobial activities against 5 bacteria (*E. coli*, *S. aureus*, *Proteus mirabilis*, *Pseudomonas aureginosa* and *Bacillus sp.*) with one fungus (*Candida albicans*). It is a whitish liquid produced by natural fermentation of the sap of *Elaeis guineensis* and *Raphia hookeri*.

Sopi and *Moke* processing techniques differred with the kind of palm wine originated from other areas. *Sopi* and *Moke* processing with traditionally and the ripening process are longer in East Nusa Tenggara area. The purpose of this study was to determine the antimicrobial effects of *Sopi* against *E. coli,* and *Moke* against *Salmonella sp.*

MATERIALS AND METHODS

Sample collection: *Sopi* samples (n=5) were collected from *Sopi* sellers around Kupang, the capital of East Nusa Tenggara, whereas *Moke* (n=5) samples were collected from different regions in Flores, one of the main islands in East Nusa Tenggara. *Sopi* was tested against *E. coli,* which was isolated from cattle, and *Moke* was tested against *Salmonella sp.* which was a local isolate from poultry. The susceptibility test of the two traditional fermented beverages were conducted in the Laboratory of Microbiology and Public Health Veterinary, Faculty of Veterinary Medicine, University of Nusa Cendana, Kupang.

Determination of pH and alcohol level: For the determination of alcohol level of *Sopi* and *Moke*, an alcohol meter was used. A pH meter was used in determination of pH or acidity of the analyzed solutions. Prior to use, the pH was calibrated with an acid-base buffer at the pH 7. The alcoholic beverages were placed in different beaker glasses before the pH meter was dipped into each solution. The measured results were then recorded.

Determination of antimicrobial activity of *Sopi* and *Moke*: The susceptibility test was perfomed to determine the antimicrobial activity of *Sopi* and *Moke* against the listed microorganisms. The suseptibility test method following the procedures described by National Committees for Clinical Laboratory Standard (2002). The suseptibility test was done by application of *Sopi* and Formaldes® onto *E. coli* culture; and *Moke* and Antisep® onto *Salmonella sp.* culture. After incubation for 24 h at 37°C, the plates were subsequently examined for the appearance of zone of inhibition. The tested bacteria susceptibility to antibacterial agents was determined through the measurement of zone of inhibition diameter.

RESULTS

Determination of alcohol level and pH: The average level of alcohol of *Sopi* measured by alcohol meter was 39%, whereas the same parameters for *Moke* was 33%. The pH recorded from pH meter was 4 for *Sopi*, whereas for *Moke*, it was 4.3.

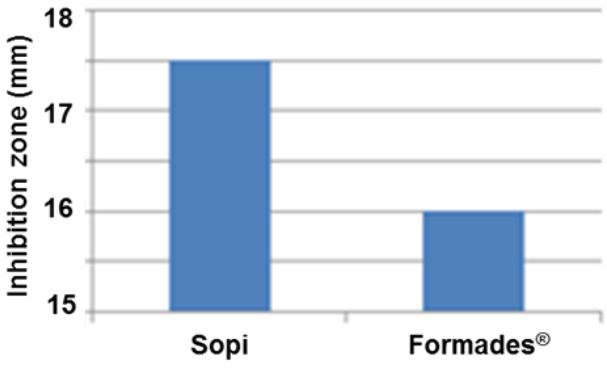

Figure 1. The zone of inhibition by *Sopi* and commercial disinfectant (Formades®) against *E. coli.*

The susceptibiliy test of *Sopi*: This test aims to examine the ability of *Sopi* to inhibit the growth of

identified bacteria in comparison with the similar activity of a commercial disinfectant agent (Formades®). The result showed that *Sopi* was capable to inhibit growth of *E. coli* and produced 17.5 mm zone of inhibition, while Formades® had 16 mm in zone of inhibition against *E. coli* (**Figure 1**). The results suggested that *Sopi* has the antimicrobial activity against the tested bacteria isolated from cattle. The activity was similar to the activity of Formades®.

The susceptibiliy test of *Moke*: The test aims to examine the antimicrobial activity of *Moke* against *Salmonella sp.* in comparison with the similar activity of Antisep®, another non-natural disinfectant agent. *Moke* and Antisep® are the main materials of the test. The results showed that *Moke* had inhibition zone of 17.5 mm and Antisep® had 28 mm in diameter against the same isolate (**Figure 2**).

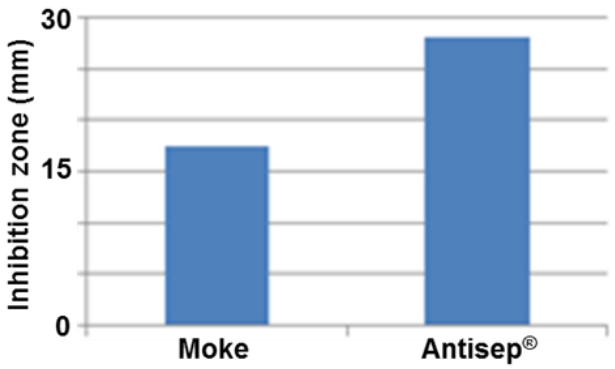

Figure 2. The zone of inhibition by *Moke* and commercial disinfectant (Antisep®) against *Salmonella sp.*

DISCUSSION

The results of susceptibility test performed on both alcoholic beverages indicated that *Sopi* had bactericidal effect on *E. coli* and *Moke* had bactericidal effect on *Salmonella sp.* It has been suggested that this finding is related to the chemical properties of both domestic alcoholic beverage, which contain alcohol, phenolic compounds and acid value of pH. This finding seems to be in agreement with previous study conducted by Vaz (2012). In their report, they stated that wine as alcoholic beverage has chemical properties of organic acids, ethanolic and phenolic compounds.

The antimicrobial activity of *Sopi* and *Moke* relates to the alcoholic compound which denaturized protein and lysed the cell of bacterial membrane, as shown by *Sopi* and *Moke* with alcohol level as much as 39% and 33%, respectively. Ali et al. (2001) on their report suggested that alcoholic compounds have a bactericidal effects on vegetative form bacteria. Thus, ethyl alcohol is frequently used as the base of disinfectants. The bactericidal effect associates with the alcohol's ability in changing the chemical structures of permeability of bacterial cell walls. Even, alcohol level of 85% penetrates easily into the enzyme system of microorganisms, especially targeting dehydrogenase and oxidase, inhibit bacteria normal metabolism as well as bacteria growth and its reproductive system (Rutala and Weber, 2008).

Moreover, the antimicrobial ability of *Sopi* and *Moke* also related to their phenolic compounds as confirm through the previous finding of Detha and Datta (2016) and García-Ruiz et al. (2008). Similary, Zuraida et al. (2011), stated that phenolic has an important role which affect the bacteria activity. Naturally, phenolic is a secondary metabolite of fruit, vegetable, grains and nuts, grapes and honey (Ross and Kasum, 2002). In addition, Cetin-Karaca (2011) suggested phenolic as a natural antibacterial and has great potency to preserve food.

Phenolic activity in inhibiting undesired organisms associated with its capacity to inactivation cellular enzyme which altered membrane permeability (Moreno et al. 2006). In supporting this, Blaut and Clavel (2007) have suggested that the phenolic activity in changing the cellular permeability resulted in cell death, since the enhancement of membrane permeability is an essential factor of bacteria mechanism of action. Generally speaking, it has been suggested that phenolic activity to inhibit the growth of bacteria are varied among each bacteria, depends on the surface structure of whether Gram negative and Gram positive bacteria. Gram-positive bacteria are known more susceptible to phenolic acids than their Gram-negative counterpart (Cueva et al. 2010).

The results of the present study showed that *Sopi* and *Moke* had acidic pH of 4 and 4.3, respectively, which indicated that the beverage were unfavorable for bacterial growth. Thus, *Sopi* and *Moke* could be added onto a medium for acidic environment in order to enhance their antimicrobial activities (Klein et al. 2006). The level of alcohol, phenolic compounds and acidic pH might have synergistic effects on the antimicrobial activities of these traditional fermented beverages.

CONCLUSION

The traditional fermented beverages, *Sopi* and *Moke* have antimicrobial activities against *E. coli* and *Salmonella sp.*, respectively. However, the mechanism of action is still unclear. Further studies are needed to confirm the mode of action of the *Sopi* and *Moke*.

CONFLICT OF INTEREST

None of the authors have any conflict of interest.

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Nothing to declare.

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