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# Effect of Antimicrobial Plants on Indigenous Microorganisms from Rumen *Bos Taurus* in The Fermentation Process

**A. Meyuliana[a]* and T. Astuti[b]**
[a]Department of Agrotechnology, Faculty of Agricultural, University of Mahaputra Muhammad Yamin
[b]Department of Animal Science, Faculty of Agricultural, University of Mahaputra Muhammad Yamin

***Corresponding author: auliameyuliana@gmail.com**

## ABSTRACT

Indigenous microorganisms (IMO) are used in various agricultural activities. IMO used as a bioactivator for animal feed fermentation. IMO from bovine rumen *B. taurus* can be used as a bioactivator but it has contamination with pathogenic microorganisms. The antimicrobial plants tested to suppress the growth of pathogenic microorganisms during fermentation were *Syzygium polyanthum*, *Cassia alata*, *Anredera cordifolia*, and *Piper betle*. Antimicrobial plant fermented with rumen fluid. The results of IMO fermentation with antimicrobials were then analyzed for the microorganisms that grew in them and the display of the number of microorganisms growing. The results of the most growth of microorganisms are without antimicrobial treatment. The suppression of microbial growth on indigenous microorganism fermentation with antimicrobial plant *C. alata* obtained the highest yield, which was able to suppress up to 84% of microbial growth on NA medium.
**Keywords:** antimicrobial, indigenous microorganism, rumen, fermentation

## INTRODUCTION

Plant leaf extracts have chemical compounds such as antioxidants, antimicrobials, and antifungals that can suppress the growth of pathogenic microbes and pathogenic fungi (Barbieri et al., 2017). *Syzygium polyanthum* contains essential oils (citral and eugenol), tannins, and flavonoids. The results of the phytochemical test of *S. polyanthum* leaf extract found polyphenolic compounds, alkaloids, and flavonoids (Khunaifi, 2010). Gelinggang (*Cassia alata*) has biological activity as an antibacterial and anticancer (Jayasree et al., 2016). *C. alata* has the potential to be a fungicide because it controls pathogenic fungi (Thimoty et al., 2012). Leaf extract of *Anredera cordifolia* has an antibacterial activity that can inhibit the growth of *E. coli* and *S. aureus* bacteria (Veronica et al., 2017). *Piper betle* is known as a plant that has compounds that play a role in antimicrobials such as carvacrol, euganol, and cavibetol. *P. betle* also has stearic and palmitic acid compounds that

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have antimicrobial activity (Khameneh et al., 2019).

Indegenous microorganisms (IMO) are widely used as activators in the fermentation process. Sources of microbes for the process of making IMO can come from the rumen of livestock such as cow (*Bos taurus*) and buffalo (*Bubalus bubalis*) (Astuti et al., 2020). Microbes that are important in fermentation namely fungi, bacteria, and yeast (yeast) are microorganisms that can grow on several fermentation substrates (Kurniawan, 2018). Rumen fluid is a potential source of microorganisms to be used as bioactivators (Das and Qin, 2012). The results of the isolation and identification of microbes contained in the rumen fluid obtained xylanolytic bacteria, namely *Bacillus sp*, *Cellumonas sp*, *Lactobacillus sp*, *Pseudomonas sp*, and *Acinetobacter sp*. (Lamid et al, 2006). The contents of the rumen are feed ingredients that have been digested but have not been used by livestock and these feed ingredients are indispensable for the survival of rumen microbes (Priyanto, 2008).

The rumen isolated from freshly slaughtered cows contains many microbes and includes pathogenic microbes (Adenji, 2015). The use of rumen fluid as an activator for fermentation needs to be watched out for whether it contains pathogenic microbes or not. It can certainly be used as a bioactivator in the fermentation process of feed ingredients if it is safe from pathogenic microbes. This study used several types of antimicrobial plants to suppress the growth of pathogenic microbes in the IMO fermentation process.

## MATERIALS AND METHODS

### Rumen *B. Taurus* Fluid

The study used 2,500 grams of rumen taken from cows at Slaughterhouse, Solok City, West Sumatra.

### Antimicrobial Plant Ingredients

Each leaf of *S. polyanthum, C. alata, A. cordifolia,* and *P. betle* was 100 gr. Carbohydrate sources used molasses as much as 1250 gr and 10 L of soybean soaking water.

### IMO Fermentation

IMO was made from rumen fluid, antimicrobial leaf extract, molasses, and soybean soaking water mixed with all ingredients and placed in an incubator. The treatment consisted of four types of antimicrobial leaves and one control without antimicrobials. The fermentation is left for one week, after which the fermented liquid is

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taken to analyze the growth of moles contained in it.

**Isolation of Microbes from IMO Fermentation**

After one week of fermentation, 1 ml of the fermented liquid was taken. The fermented MOL liquid was diluted to 10-8 and then grown on NA media and PDA media.

## RESULT AND DISCUSSION

The results of microorganisms growing on NA and PDA media after one week of observation with antimicrobial treatment in the fermentation of IMO. Optimum bacterial growth after 5 days of growth then at weeks 6 and 7 the average no longer experienced an increase in the amount of growth.

The growth of bacteria and fungi on culture media was optimum on the third day after being grown. This is also influenced by the incubation temperature because the temperature of the origin of bacterial growth will affect its growth in culture media (Chikere and Udochukwu, 2014).

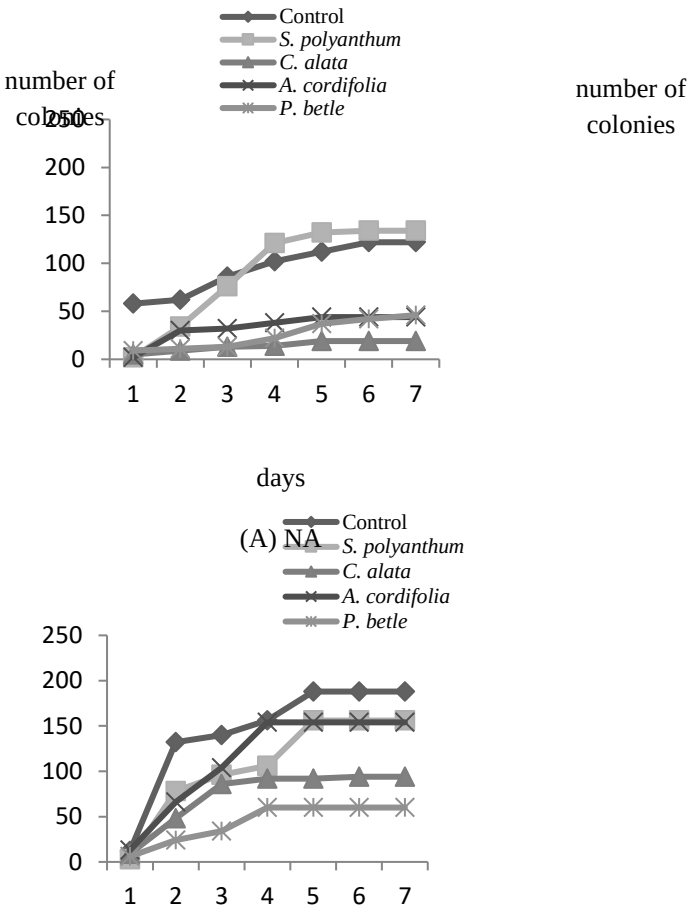


Figure 1. Graph of growth of bacteria and fungi on culture media (A) NA and (B) PDA

The number of microbial colonies that grew on NA and PDA media as a result of MOL fermentation showed the highest number of fungal growth on PDA media reaching 188 colonies, while on NA media only reached 134 colonies. The research of Astuti et al., (2020) also showed similar results where the microbial growth of IMO with bioactivator from the rumen of cows and buffaloes the number of fungi that grew more than bacteria.

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The number of bacterial and fungal colony growths observed with

*S. polyanthum* treatment on NA and PDA media emphasized that it was less effective. When compared, it even looks the same as the negative value or more microorganisms that grow if the control.

There are 2 *Syzygium* species found in Indonesia, namely *S. aromaticum* and *S. polyanthum*. Both of these species have volatile properties that have been developed as antimicrobials and have shown that S. aromaticum can suppress the growth of pathogenic microbes such as *Staphylococcus aureus*, *Salmonella typhimurium*, and *Vibrio cholera*. However, the results of this study did not inhibit the growth of *Escherichia coli* (Hamad et al., 2017).

*C. alata* was able to suppress microbial growth up to 84% on NA media. While on PDA media the highest emphasis was on *P. betle* by 68%. The content of antimicrobial compounds in *C. alata*, *A. cordifolia*, and *P. betle* causes these plants to have the ability to control microbial growth. Khameneh et al., (2019) said compounds that play a role in inhibiting microbial growth are carvacrol, euganol and cavibetol. *P. betle* also has stearic and palmitic acid compounds that have antimicrobial activity.

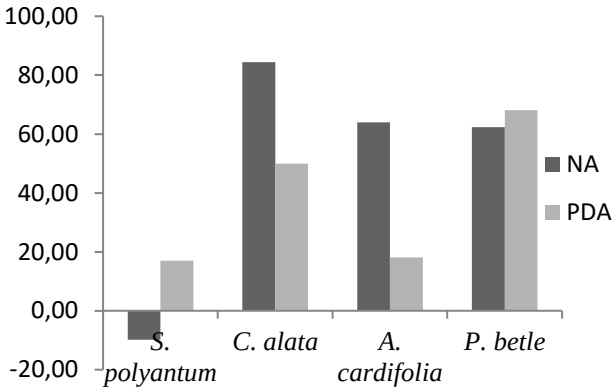


Figure 2. Percentage of Microbial Growth Inhibition

## CONCLUSION

The growth of indigenous microorganisms fermented with antimicrobial plants has a suppressive effect. The suppression ability of each antimicrobial is different depending on the compounds contained in the antimicrobial. The highest growth suppression with antimicrobial *C. alata* leaves reached 84%.

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