INTRODUCTION
Spermicides are a biologically obvious way to immobilize or kill the sperm upon contact [1]. An ideal spermicide should immediately and irreversibly produce immobilization of the sperm, nonirritating to the vaginal and penile mucosa, not have adverse effects on the developing fetus, free from long-term topical and systemic toxicity and should not be systemically absorbed [2]. The Durio zibethinus Murr. cortex extract has been used as traditional contraceptive in South Borneo. The efficacy of the D. zibethinus cortex extract was investigated on mice sperms and human sperms [3].

The challenges of developing formulation from plants are the intense color spoiled the final product appearance. The purpose of this study was to determine the effect of decolorization and the best formula for preparation the spermicide gel from D. zibethinus cortex extract.

MATERIALS AND METHODS

Materials

*D. zibethinus* cortex was provided from Banjar District in South Borneo, ethanol 96% (Mulya Jaya); glycerin (Brataco); hydroxypropyl methylcellulose (HPMC) K100M (Honest); methylparaben, propylparaben, and propylene glycol (CV. Agung Menara Abadi); and polyethylene glycol (PEG) 6000 (Asia Chemical Co.).

Methods

Decolorization used active carbon
The activated carbon was inserted to the raw extract of the *D. zibethinus* cortex. The ratio of the raw extract and powdered activated carbon was 1:0.001 with contact period was 10 second. After the treatment, the treated extracts and non-treated extract were measured their total phenolics.

RESULTS

Total phenolic assay
An aliquot (0.5 ml) of the extract was added to volumetric flask containing 0.75 ml of Folin-Ciocalteu reagent and then shaken. After 5 minutes, 2 ml of 2% Na₂CO₃ solutions was added to the mixture. After incubation for 15 minutes at room temperature, the absorbance was determined with an ultraviolet-visible spectrophotometer [4].

Preparation of solid dispersion extract
Solid dispersion of the *D. zibethinus* cortex extract was prepared with variation of the PEG 6000 concentration were 2%, 4%, 6%, and 10%. The extract quality was investigated by total phenolic. The gel preparation was evaluated for pH value, viscosity, and spreadability.

Conclusion:
The decolorization increased final product appearance and formulation with 2% of PEG 6000 was found to be the best.

Keywords: Spermicide gels, *Durio zibethinus*, Decolorization, Solid dispersion.
gels were sheared at 12 rpm. Standard of viscosity was around 2000-4000 cPs [9].

**Determination of spreadability**
Sample was applied between two glass slides and was compressed to uniform thickness by placing 125 g weight for 1 minute. Spreadability was known from the calculation of diameter of sample. [10]. Standard of spreadability of gel is around 5-7 cm [11].

**RESULTS AND DISCUSSION**

**The decolorized effect**
One of the challenges of using the plant parts in formulation is the dark color of the extract. Decolorization is one of the approaches that can be applied to remove unwanted colors. Activated carbon is the most commonly used for dye and odor removal by adsorption. The decolorized effect on the *D. zibethinus* cortex extract is illustrated in Fig. 1.

We can clearly see the effect of the decolorization by using activated carbon. The differences of color showed that the decolorization can eliminate the intense color of the extract. Activated carbon adsorbed the dark-colored compound [12]. The result of the current study agrees with another study that powdered activated carbon is more suitable for color adsorption [13].

**The result of the total phenolic assay**
Activated carbon also absorbs some amount of phenolic. Total phenolic assay is very important to achieve desired decolorization effect without significant loss of phenolic. The optimal process parameters for activated treatment are needed. The results of total phenolic in the *D. zibethinus* cortex extract are presented in Table 2.

The analysis of total phenolic showed decreased total phenolic. Hence, 0.001 g of activated carbon could reduce 23.25% of total phenolic.

**The spermicide gels preparation**
The spermicide gels prepared were found to be brown, translucent, and homogeneous for each formula (Fig. 2).

The design of this preparation with decolorized and solid dispersion increased appearance of the gels preparation.

**Evaluation of the spermicide gels preparation**
All the prepared gels were subjected to evaluation for pH value, viscosity, and spreadability. The result of evaluation is presented in Table 3.

**pH value**
The pH value of the spermicide gels was decreased with the increase of the PEG 6000 concentration in the formulation (p<0.05). The decrease of pH value might be indicating formation of acidic degradation. Higher concentration of PEG has less dissolved oxygen. Excluding oxygen slows the formation of acids. Hence, the increase of the PEG 6000 would decrease pH value. However, the spermicide gels had suitable pH for skin pH and would not produce skin irritation.

**Viscosity**
The viscosity of the spermicide gels was increased with the increased of the PEG 6000 concentration (p<0.05). The increase of the PEG 6000 would increase viscosity [14]. These polymers cause modification of the process of micellar association, increase entanglement of adjacent molecules with more extensive intermolecular hydrogen bonding [15]. The spermicide gels had suitable viscosity for gels preparation.

**Spreadability**
The spreadability of the spermicide gels was decreased with the increase of the PEG 6000 concentration (p<0.05). The viscosity may be the cause of decreased in spreadability [16]. The cohesive forces made...
the larger interaction between molecules and caused the preparation would be difficult to spread.

CONCLUSION
The decolorization increased final product appearance and formulation with 2% of PEG 6000 were found to be the best. The D. zibethinus cortex extract can be an alternative compound for future use as safe spermicide.

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