Analysis of Component and Water Holding Capacity from Distillate Waste of Citronella (*Cymbopogon nardus*) as A Litter Material

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ABSTRACT

This study aimed to examine the components and water absorption of distillation waste of citronella essential oil. The method used for water content from the waste of citronella essential oil was a proximate method, the method used for the capacity to absorb water from the waste of citronella essential oil was a vacuum method. Furthermore, the method used for experimental bioactive content was densitometry method. Data were analyzed using descriptive analysis. The results showed that the water content and water holding capacity of the waste from citronella essential oil was 11.25% ± 0.007 water content and water holding capacity 50.25% ± 4.870. While the water content of rice husk was 9.87 ± 0.423 and water holding capacity was 65.98 ± 0.325. Based on the qualitative analysis from the waste of citronella essential oil obtained the *Geraniol* content. the waste of citronella essential oils have higher water content and lower water holding capacity than rice husks.

Keywords: distillate waste of citronella, litter, water content, water holding capacity, bioactive compounds

INTRODUCTION

Broiler maintenance generally uses litter system, litter material usually from rice husk, wood shavings, rice straw, peanut shell, and paper. Litter material is widely used because it gives a real effect on the growth of broiler. Good litter material requirements are high water absorption, low water content, cheap, non-nutritious and non-toxic. Torok et al. (2009) stated that the ideal litter material requirements should be dry with a high water holding capability and were able to release water rapidly into the atmosphere. Demirulus (2006) stated that the use of pine wood shavings as a litter material in broiler can give a good effect on broiler performance.

Musa et al. (2012) stated that the use of rice husk, wood shavings, rice straw or wheat and peanut shells because that material has different benefits as a litter. Davis et al. (2010) stated that some litter materials have been reliably useful. One of the litter materials is leftover products from rice such as rice husks. Musa et al. (2012) reported that rice husk was used as a litter material because it was not dusty, fast dry, high density while Ferrante et al. (2006) stated that wood shavings serve as a litter material because it has a high water holding capacity.

Distillation waste of citronella essential oil has not been utilized in the livestock business and so far only a small portion is used for ruminants feed. Nurawaliah (2014) asserted that waste from patchouli can be utilized as litter material and also can be used as a material to prevent coccidiosis disease. The waste from distillation of citronella (*C. nardus*) certainly can have a good effect in the prevention of diseases caused by bacteria, protozoa and parasites.

The waste of citronella essential oil also can be utilized as an antiparasitic material because it is expected that the remaining distillation of citronella still contains *Geraniol* and *Citronellal* bioactive compounds which, although the content is not much contained in the essential oil of citronella. De-Oliveara et al. (2010) stated that the largest compound content in the essential oil of Brazilian nardus namely *Citronellal*, *Geraniol* and *Citronellal* were 34,60, 23,17 and 12,09%. *Geraniol* and *Citronellal* compounds in citronella essential oils can serve as antiparasitic agents. Monzote et al. (2011) reported that the *Citronellal* content of *C. citratus* may serve to kill *Tripanosoma cruzi* parasites.

Based on the content of bioactive compounds from citronella oil (*C. nardus*), the distillation waste if used as a litter material in the chicken coop will provide good benefits in the prevention of diseases caused by parasites so that the use of waste of citronella essential oil can reduce the cost of maintenance at farm.

MATERIALS AND METHODS

Materials

Distillation waste of citronella essential oil (C. nardus) from Pendem village, Ngablak subdistrict, Magelang regency, Central Java, *Geraniol* and *Citronellal* reagents from Sigma Aldrich, ethanol 70%, anisaldehyde sulfuric acid serves as spray reagent for stain, rice husk, and water.

Equipment used for extraction, qualitative and quantitative analysis ie oven, 25 l stainless duct, flannel, water bath with diameter 30 cm, micropipette size 0,5-10µ and size 100-1000µ, chamber measuring 20x20x5 cm, sprayer measuring 10 ml and thin layer Chromatography of KgaA 64271 Darmstadt brand from Germany. Equipment for water content analysis ie petri dish and for water absorption using 500 mL measuring glass, becker glass 100 mL and 0.75mm diameter filter.

Methods

1. Material extraction using Maseration method adopted by Beroa et al. (2009)
   Refined coconut oil distillation waste of 400 g, dried in the oven for 24 hours at a temperature of 70 ° C, then mashed until the form of flour. The flour was put into stainless and 70% ethanol solvent was added with a ratio of 1: 7. The material mixture was allowed for 24 hours then filtered and evaporated over the water bath at a temperature of 60-70 ° C to obtain a thickened extract material.
2. Qualitative Analysis
   Qualitative analysis of distillation waste of citronella essential oil using Densitometry method (Harbone, 1998). Samples taken as much as 55.1 mg from the extraction result were subsequently diluted in 1000 µL ethanol and subsequently sampled with 9 µL volume, *Geraniol* and *Citronellal* reagents of each volume of 1 µL were bottled on silica gel 60 F254. The 4 x 10 cm plate was eluted with a hexane motion phase: ethyl acetate in a ratio of 9: 1 (eluent) to a 1 cm elution limit. The plates are dried and sprayed with 5 mL of sulfuric acid anisaldehyde. Then the plate is heated in a 105 °C oven for 5 minutes to visible spots and then the plate is seen in UV light.
3. Water content analysis
   The method used to measure water content was the proximate method (AOCC, 2005). Samples of distilled citronella essential oil and rice husks were mashed, petri dish was weighed and fed into the oven and heated to 105 °C for 1 hour. Petri dish was cooled in a desiccator, then weighed (ms). Each sample of the wastewater distillation waste and rice husk was placed in a petri dish and weighed 50 g (ms1), then fed into the oven and heated for 8 hours or until the weight remained, the sample cooled in the desiccator for the next 30 mins then weighed (ms2).

$$\text{water content} = \frac{ms1 - ms2 \times 100\%}{ms1 - ms}$$

4. Water holding capacity analysis

The method used to measure water holding capacity was the vacuum method, adopted by Atapattu and Wickramasinghe (2007). The remaining sample of citronella distillation was cut ± 3 cm, the sample weighed as much 50 g (P1) and inserted in a container, water measured as much as 200 ml was then put in a container containing the sample, the material was left for 24 hours, then the water filtered from the container containing the next sample of the weighed material (P2). The same is done on rice husk samples.

$$\text{Water holding capacity} = \frac{P2 - P1 \times 100\%}{P2}$$

Results Analysis

Data were analyzed descriptively based on (Gomez and Gomez, 1995) to obtain the average value of bioactive content, water content and water holding capacity. Mathematical model used:

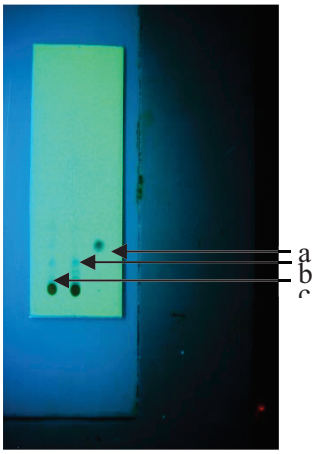
$$\bar{x} = \sum_{i=1}^{n} \frac{xi}{n}$$

Note : $\bar{x}$ = mean
xi = sum
n = amount of data

RESULT AND DISCUSSION

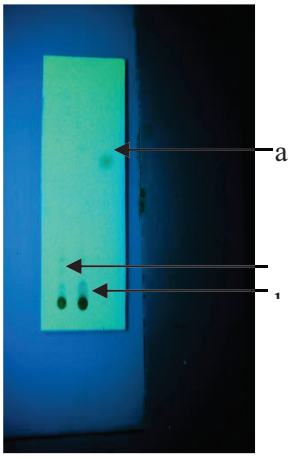
Qualitative Analysis of distillation waste of citronella essential oil

The results of the qualitative analysis (Fig. 2) showed that when samples of extracts of distillation waste of citronella essential oil were sterilized with *Geraniol* reagents, the visible stains were visible on UV light. When a sample of was sterilized with *Citronellal* reagents, no visible stains are visible on UV light (Figure 4). This means that the qualitative of distillation waste of citronella essential oil still contains *Geraniol* compounds and does not contain citronella.



Note :
a : *Geraniol* reagent
b : Samples of extracts of citronella waste that have been eluted
c : Samples of extracts of citronella that have been eluted

Figure 1. Geraniol compounds that have been dispayed in UV 254



Note :
a : S*itronelal* reagent
b : Samples of extracts of citronella waste that have been eluted
c : Samples of extracts of citronella that have been eluted

Figure 2. Geraniol compounds that have been dispayed in UV 254

The causes of the presence of geraniol content in the waste of citronella distillation because *Geraniol* is one of the largest compounds in citronella. *Citronellal* compounds are not contained in the waste of citronella distillation because the content of *Citronellal* compounds has been depleted in citronella oil when the citronella distillation takes place so that when extracted and re-analyzed no results are obtained. The method used in the distillation can affect the content of the resulting compound. Hazwan et al. (2014) stated that distillation of citronella (C. nardus) by using the Ohmic-heated hydro-distillation, Hydro-distillation and Steam distillation methods produce different *Geraniol* and *Citronellal* compounds. The method of distillation of citronella which is done in distillation place in Ngablak is direct distillation method.

Different locations or growing areas may affect the content of the compounds in citronella. The content of metabolite compounds in citronella that grows in the area above 1200 m above sea level (asl) is lower than the content of citronella compound that grows in the area below 1200 m asl while growing optimum at an altitude of place 250 m asl (Kardinan, 2005). The low *Geraniol* content and the absence of *Citronellal* compounds in the residual distillation of citronella because it is likely influenced by the place where the lemon grass grows is 1,378 m above sea level ie Ngablak subdistrict.

Water Content

The results showed that the water content of citronella (*C.nardus*) was slightly higher than the water content of rice husk (Table 1).

Table 1. Result of analysis of water content and water holding capacity of distillation waste of citronella and rice husks

No	Sample	Water content (%)[1]	Water holding capacity (%)[2]
1.	Citronella waste	11,25±0,007	50,25±4,870
2.	Rice husks	9,87±0,423	65,98±0,325

Description: 1) Biochemistry Laboratory of UGM Faculty of Animal Science, (2016)
2) Poultry Science Laboratory of UGM Faculty of Animal Science, (2016)

The water content of distillation waste of citronella was higher than rice husk because it was influenced by material characteristics and processing process. Rice husk has a moisture content slightly lower than citronella distillation but both materials have a hygroscopic nature of litter that was able to absorb or release water to the environment. Garces et al. (2013) reported based on the characteristics and qualities of rice and grass husk litter materials *(Panicum maximum*) in absorbing water, rice husk is better absorbing water compared to Guinea grass *(Panicum maximum*).

In this research, the process of distillation of citronella essential oil by boiling. Manoi (2007) added that the process of distillation of patchouli essential oil in the way of boiling to produce essential oils and wastes containing water. distillation waste of citronella essential oil contains water after dried with ± 2 days in the sun and dry in the air for 8 days water content of 11.25% and almost close to rice husk water content of research results 9.87%. Atappatu and Wickramasinghe (2007) stated that the rice husk water content of 10.3% was used as litter material. Fairchild and Czarick (2011) suggest that a good water content for litter materials was ± 10%. Mante and Agblevor (2010) reported that a good litter material has a water content of 8-10%.

Miles et al. (2011) showed that the materials used as litter materials such as wood shavings, rice husk and sand have the following moisture content: 7.1; 10 and 0.1%. Bilgili et al. (2009) reported that the litter materials used in broiler postcard postal systems are pine wood shavings, mortar sand and straw with a water content of 11.3, respectively; 9.9 and 12.2%. This indicates that the waste of citronella distillation has a water content that is not different from the water content of pine wood shavings.

Water holding capacity

The results showed that the water holding capacity of distillate waste of citronella was lower than the water holding capacity of rice husk (Table 1.). The ability to absorb water from the litter material was influenced by several factors including particle surface area and particle size.

The surface area of distillate waste of citronella was more extensive than the rice husk surface area so that the absorption of water from the waste of citronella is higher than the rice husk. Metasari et al. (2014) stated that wood shavings as litter material have a wider surface area than rice husk so that wood shavings absorb water higher than rice husks.
Atapattu and Wickramasinghe (2007) added that rice husk was a litter material that can absorb well but cannot release water into the air when compared with tea waste as litter material.

The particle size of the litter material affects the absorbency of the litter material because the larger size will absorb less water than the smaller particle size. Person et al. (2000) reported that the water absorption of the litter material increased due to the smaller particle size of the litter material. This differs from the results of Atapattu and Wickramasinghe (2007) research which said that litter materials that have smaller particle sizes will absorb less water than larger particle size.

CONCLUSION

Based on the result of this research, it can be concluded that the distillation waste of citronella (C. nardus) from Pendem village, Magelang Regency still contains *Geraniol*. The distillation waste of citronella has higher water content and lower water holding capacity when compared to rice husks. Further research is suggested to do research to some of the essential oil distillation waste to know the metabolite compounds.

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