USAGE OF HUMAN SCALP HAIR (HSH) AS POTENTIAL REPELLENT MATERIAL FOR WILD HOG INVASIVE ACTIVITY

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ABSTRACT

In the recent time, large amount of Human Scalp Hair (HSH) waste is being generated and dumped in municipal solid waste and to soil without any recovery process. The improper management of this waste resource may leads to many problems such as blockage in drainage system and some of chemical used and stick on the hair are hazardous to environment. In poor countries, HSH has been used as a low cost wild hog repellent. It is believed that the texture itself can cause severe respiratory problem as they sniff the material which will affect their tracking system. However, the direct disposal of HSH onto land without prior adequate treatment may leads to unpleasant odor and pathogenic breeding. This study aims to provide hair waste management through exploring the efficacy of HSH as potential repellent for wild hog. For this study, HSH was collected from nearby hair salons and washed using non-ionic detergent-acetone method to remove the impurities such as sweat, and inorganic materials before oven-dried overnight. The field test were conducted by varying the weigh of HSH used throughout the 5 days test along with evaluation on HSH efficacy through reduction on corn feed used as feed bait.

Keywords
Human Scalp Hair (HSH), wild hog, repellent,

1. INTRODUCTION

Wild hog is an invasive mammals species that always cause problem in human daily life especially in agricultural sector. Despite known as destructive species, the contribution of this animal in seed dispersal for plantation species is undeniable (Schupp, 1993). However, the inclination of the need between this species and human has sparked the human-wildlife conflict (HWC). This conflict exacerbated with the ability of the species in adapting with new environment and excellent in restoring their population which led their activities spread into agricultural land (Massei, 2004) and finally led to HWC (Schlageter, *et al.,*2012). HWC happened for so many years and has led to several negative impact such as deterioration and damage of crop (Habib, 2015). Some minor cases involve fatality and injury. The worst case of this species attack on agricultural land has been reported on 1973 by Diong in Changkat Cermin, Perak. Normally, wild hog use their snout and sense of smell that has been developed since piglet phase in order for them to survive (Kittawornrat et al., 2011). They can be found in group for female, consisting of sow and her litter, while for the adult male, most of them companionless as shown in Figure 1. The traditional method shown that, human scalp hair (HSH) has become the alternative way for most of small farmer to reduce the problem of wild hog attack on agricultural as they are cheap and easy to obtain. Murty (2011) in his review stated that, the usage of HSH will disturb the tracking system of that species by causing respiratory irritation to the pests as they sniff of it. Potential of HSH in agricultural may open further research and expand their potential in agricultural which will significantly contribute to the hair salon waste management and reduce problem of blockage in draining system.

Figure 1. Image of wild hog from footage taken in November 2016. a) Female wild hog usually move in a group, consisting of sow and her litter and b) The mature male wild hog normally companionless.

A study conducted by Vasudeva in 2015 has proven the effectiveness of HSH usage in reducing the nuisance by reduction from 70% up to 80% (Agrawal et al., 2016). However, until now, the usage of HSH on land didn't emphasis on the method of processing prior its usage on agricultural. Figure 2 show the undertaking of HSH research and until now, the commercialization of HSH as repellent are still far behind from Gupta (2014) review.

New uses/areas of research	Countries where research is undergoing
Liquid fertilizers	India, USA, Korea, and Bangladesh
Concrete reinforcement	Canada, India
Pollution control	Canada, Singapore, India, Iran, Korea, Egypt, and Jordan
Molded furniture and objects	UK
Engineering polymers	Singapore, China, Japan, and India
Follicle cell cultures/tissue regeneration	Switzerland, UK, Korea, and France
Composites for superconducting systems	India, Greece, and The Netherlands
Flexible microelectrodes	China

Figure 2. List of countries undertaking new research on human scalp hair (HSH)
Reference: Gupta, 2014

2. MATERIALS AND METHODS

2.1. Hair Segregation, Hair Washing Process and Procedure

HSH collected from hair salon will undergo segregation and washed with detergent as in Figure 3. Hair that has been separated from impurities were placed in a clean polyethylene. HSH is subsequently washed using non-ionic detergent-acetone washing method (Cheng et al., 1992; Sen J *et. al.,* 2001). HSH is rinsed using distilled water and oven-dried at 90^{o}C overnight. The dried hair is then washed in 5% dilution of non-ionic detergent. Tween 80 has been used as the non-ionic detergent. Hair is washed for 30min and rinsed with deionized water. This process is important to remove the impurities of all form contaminant such as oil, dust, organic matter from the human hair that might cause pathogen breeding..

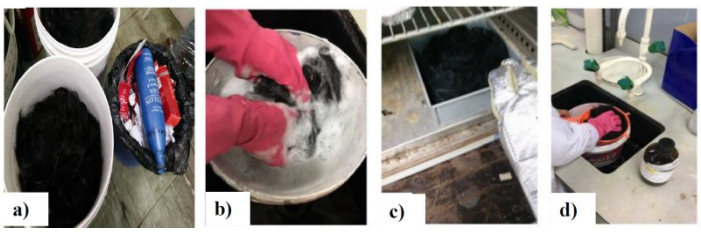

Figure 3. During the washing process, HSH undergo the segregation process and washed using mild detergent and non-ionic detergent to remove the impurities such as oil and dirt.

Hair were subsequently washed with 1:1 of acetone and deionized water in a clean polyethylene container for 30 minutes and rinsed repetitively using deionized water before oven-dried at 100ºC overnight. The step is simplified as in Figure 4. This step is essential to remove the inorganic pollutant on the hair strands (Sen J *et. al.,* 2001).

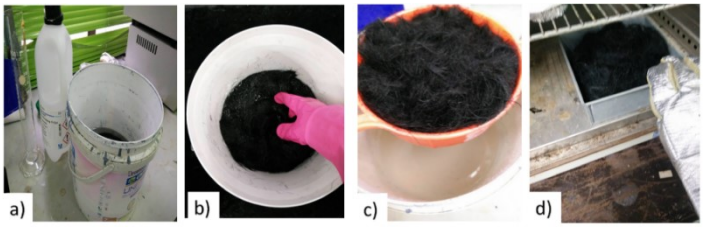

Figure 4. The acetone wash is essential to remove the inorganic pollutant that come from hair product on hair strand.

2.3 Repellency Test on the Field

This study on effectiveness of human scalp hair (HSH) as repellent has been conducted between 25th April 2017 until 29th April 2017 at private orchard located in Kampung Parit Mohamad, Bukit Bakri Muar. The effectiveness of human hair as repellent material is observed through measuring the weight for remaining corn feed along the test period. This feeding test is conducted within 5 days. The use of corn feed as bait is remain constant along the study which is 5kg of corn feed for each samples per trial day, while the usage of human hair is varies; 20 grams (g) ; 40 grams (g); and 60 grams (g). The test of HSH as repellent is categorized into; (a) corn feed; (b) corn feed mixed with 20g of HSH; (c) corn feed mixed with 40g of HSH; and (d) corn feed mixed with 60g of HSH. The process of test is simplified in Figure 5. The weight before and after for bait feed is measured.

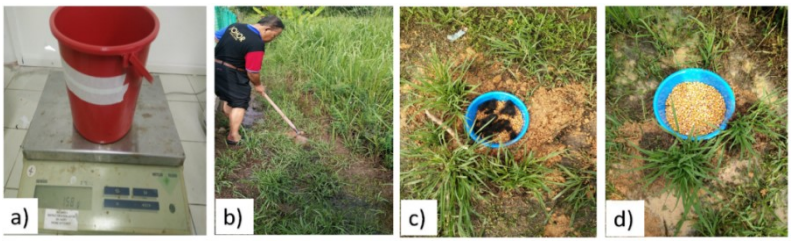

Figure 5. The feed corn mixture is weighed before and after the repellency test on the wild hog. The results is observed and recorded.

3. RESULT AND DISCUSSION

3.1. Repellency Test on Day-1 and Day-2

The remaining of corn feed reading (in kg) shown slightly change in day-1 and day-2 as in Figure 6 and Figure 7. For day-1, sample A showed 4.47kg remaining which means about 89% remained uneaten. While for sample B, and sample D only 0.10kg is eaten, and 98% remained uneaten. Meanwhile, for sampel C is remained uneaten. For day-2, the control sample A showed 89% of corn feed remained uneaten, while 97% of sample B is remained uneaten. Both sample sample C and D, showed 99% of corn feed remained uneaten. The reading for remaining of corn feed on first day and second day of test show there is no wild hog activities occurs during the test. However, the study does not deny the possibilities for the presence of other small invasive animals such as birds that may contribute to the slightly change in reading.

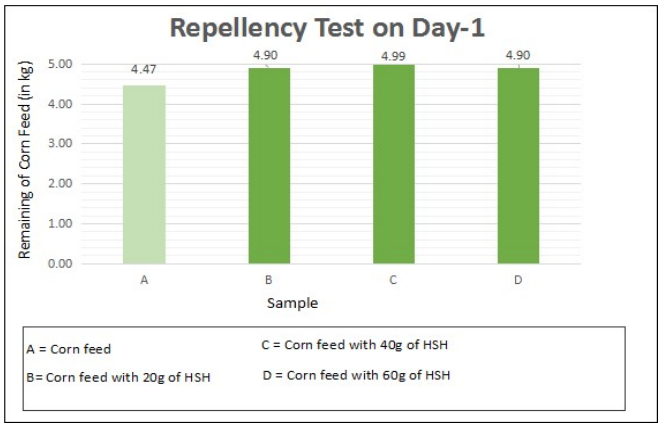

Figure 6. Remaining corn feed (in kg) of wild hog consumption following various samples for day-1 of field test.

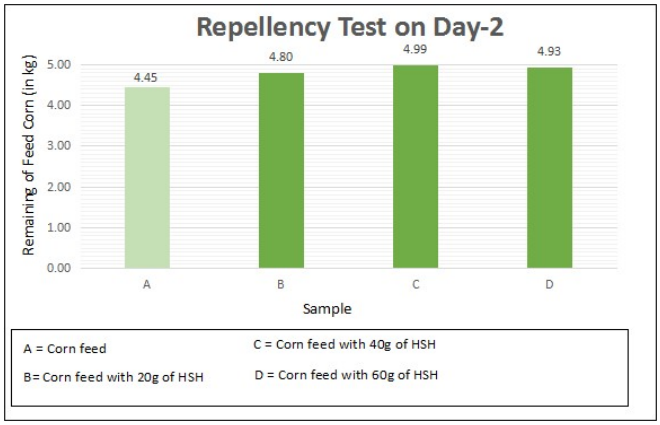

Figure 7. Remaining corn feed (in kg) of wild hog consumption following various samples for day-2 of field test.

3.2. Repellency Test on Day-3 and Day-4

On day-3 and day-4, there is a major changes in reading for remaining feed corn as in Figure 8 and Figure 9 which indicates the possibility of wild hog browsing activity at the study area. The day-3 reading for control sample A showed, 41% of corn feed remained uneaten with 2.95kg of corn feed is eaten. Sample B showed slightly losses with 4.96kg of corn feed remaining. Sample C and D are remain uneaten. For day-4 test, control sample A showed, only 39% out of total corn feed remain uneaten. Meanwhile, sample B, sample C and sample D are remain uneaten through the test day. Wild hog depend entirely on their olfactory sense as they has poor mechanism for both hearing and vision (Agrawal et al., 2016). In order to find location and territory, food and prey, these mammal used their snout to sniff from one place to another. The use of hair will cause irritation to their respiratory tract as they inhale the hair during sniffing and create fear or sense of aware

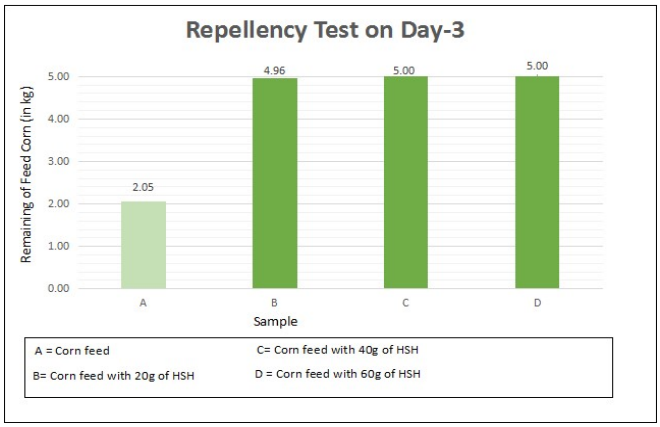

Figure 8. Remaining corn feed (in kg) of wild hog consumption following various samples for day-3 of field test.

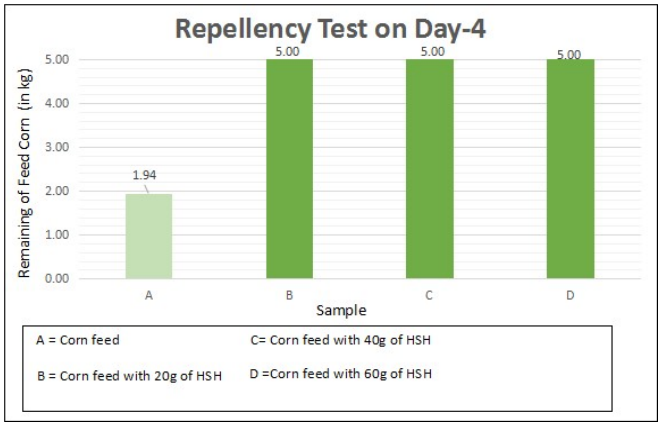

Figure 9. Remaining corn feed (in kg) of wild hog consumption following various samples for day-4 of field test.

3.3. Repellency Test on Day-5

The day-5 reading test showed the sensitiveness of wild hog towards usage of hair as repellent. The usage of HSH has triggered the effect to the reading. For control sample A, 60% corn feed remain uneaten and sample B, C and D remain constant. There are various possibilities, namely; whether the use of HSH have been impacted fear and respiratory irritation to the wild hog or they roam elsewhere for source of food.

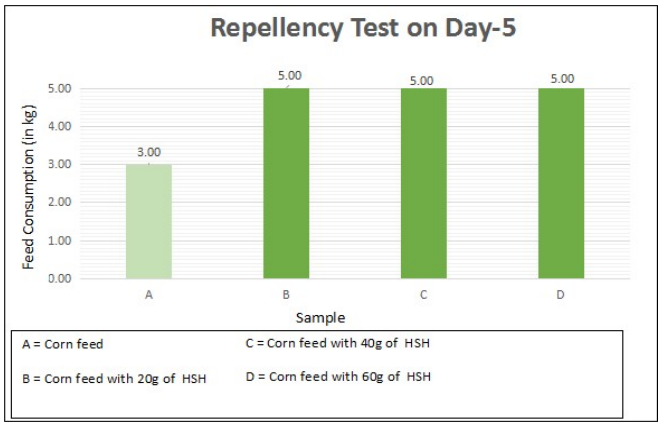

Figure 10. Remaining corn feed (in kg) of wild hog consumption following various samples for day-5 of field test.

4. CONCLUSION

In producing animal repellent, several factors need to be taken into account for the purpose of producing animal repellent. Repellent should be; user friendly; provide temporary protection from over-grazing; low-cost; easy to apply; time saving and safe for both animals and human (Stephens, 2005). Result from 5 days test indicates the potential of HSH as temporary repellent from wild hog browsing activity. This study is not just intended to prove the effectiveness of human hair as repellent, but also at the same time to promote the usage of HSH and value proposition of hair waste in agricultural. The proposition value of HSH will significantly contribute in eco hair salon waste management and to environmental for a safe disposal through prior disposal treatment.

5. ACKNOWLEDGEMENT

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