APPROACH TOWARD MINIMIZING MICROBIAL CONTAMINATION OF MILK BY FLIES (Musca domestica) USING COLOUR REPELLANT BY

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ABSTRACT

Houseflies (Musca domestica) are vector of diseases carrying viruses, bacteria, fungi and many parasites. Poor hygienic practice in environment leads to the contamination of commercially sold milk by flies thereby transmitting pathogens. This work intends to use different coloured milk to determine the least attractive to houseflies to serve as repellant using a modified peet-grady testing method. Commercially sold milk was coloured using food colours to obtained yellow, blue, green, red and white milk. These were exposed for the period of 30 minutes to the flies with a count after every 10 minutes. In the first 10 minutes of exposure, blue milk attracted 12 flies, green color attracted 7 flies, red color attracted 6, white color attracted 5 and yellow color attracted 2. At the second 10 minutes of exposure, shows blue milk attracted 9 flies, green milk attracted 8 flies, red attracted 7, white attracted 4, and yellow attracted 2 flies. On the third 10 minutes of exposure, the colors attracted 9, 7, 4, 3 and 2 house flies respectively in that order of arrangement as in the above.

Keywords: Coloured milk, Houseflies (Musca domestica), Repellant, Attraction.

INTRODUCTION

Milk is an extremely nutritious food. It is an aqueous colloidal suspension of proteins, fats and carbohydrates that contains numerous vitamins and minerals. Many of the pathogenic bacteria encountered do not grow well in milk but remain viable for undesirable lengths of time (Sangoyomi, *et al.,* 2010). Milk is a complex biological fluid and by its nature, a good growth medium for many microorganisms. (Sangoyomi, *et al.,* 2010). Milk is a pale liquid produced by the mammary glands of mammals. It's the primary source of nutrition for infant mammals (including humans who breastfeed) before they are able to digest other types of food. Early lactation milk contains colostrum's, which carries the mother antibodies to its young and can reduce the risk of many diseases. It contains many other nutrients including protein and lactose (Pehrsson, *et al*., 2000).

Houseflies Musca domestica L. are vectors of a wide range of pathogens including human diseases such as cholera, typhoid, dysentery, diarrhoea, gastroenteritis, Escherichia coli and shigella species. Many of these flies can be seen gathered around Fulani women milk sellers and sometimes they even find there ways into the the large calabash containing the milk. However, since Houseflies show mark preference for resting on surfaces with contrasting visual pattern (Chapman *et al.,* 2009), this work intends to determine the influence of colour on the attraction and repellant of houseflies by the use of coloured milk. The housefly (Musca domestica L. (Diptera: Muscidae)) Its habit of feeding on decaying matter, human waste and food, and concomitant close association with humans, has implicated M. domestica with the spread of numerous diseases including salmonella, diphtheria, tuberculosis, hepatitis and amoebic dysentery (Greenberg, 1973; Crosskey & Lane, 1993; Tan *et al.,* 1997).). Problems with excessive housefly populations are generally connected with livestock units and landfill sites used for domestic waste (Goulson *et al*., 1999) and populations seem set to increase with the projected warming of Earth's climate (Goulson *et al*., 2005). The public health risks and annoyance associated with large housefly populations are therefore substantial and efforts to exert control over the species have been the focus of considerable research for several decades (Hanley *et al*., 2004).

The environmental influence on insect behaviour patterns has been successfully incooperated into studies of ecology so that colours of the background play an important role to attract houseflies. Many colour lights are beep successfully incorporated into studies of ecology so that colors of the background play an important role to attract house fly. Many colored lights are being used (Grutzmacher and Nakano 2009). Houseflies in their daily live encounter a wide variety of materials in various physical forms including colours, but the attractiveness of many traps of houseflies have not been evaluated (Douglass and Jesses, 1994). In the laboratory studies on the response of houseflies musca domestica to colour, it was suggested that they preferentially settle on Black or Red surface, and avoid yellow or white surface (Shono *et a1*., 2004). The optical sensitivity of the houseflies lies between 310nm and 700nm which effect the attraction to certain colours and enable us to choose the favorite color of traps (Otto *et a1*.,2009).

Previous laboratory studies on the response of Musca domestica to colour suggested that they preferentially settle on black or red surfaces, and avoid blue or white surfaces (Waterhouse,1948; Hecht, 1963), although work conducted in the poorly illuminated conditions of livestock units indicated that paler colours such as yellow and white may be more attractive (Mitchell *et al.,* 1975). Other studies have suggested that the degree of contrast might be far more important than colour in evoking a response (Hecht, 1970;Howard & Wall, 1998), and in particular the use of black dots on a white background.

Although Chapman *et al.,* (2009) found that clustered groups of black spots were more effective still. Clustered spots may be effective because they mimic the localised feeding behaviour of houseflies.

Despite the many experimental trials of different visual attractants, there remains a great deal of uncertainty about which combinations of colour and pattern are most effective at luring houseflies to traps. This uncertainty stems in part from the

contradictory results emerging from studies conducted in comparatively well illuminated laboratory conditions, and those performed in generally poorly-lit livestock units. However none of these earlier studies considered the importance of housefly vision and spectral sensitivity in relation to target design. This is surprising given that a great deal is known about the visual system of M.domestica, and in particular the way in which they capture and processes light. The optical sensitivity of the housefly lies between 310 and 700 nm (Strother & Casella, 1972). Moreover, in his review of the functional organisation of M. domestica vision, Hardie (1986) describes how the photoreceptors in a housefly's compound eye have three absorbance peaks, one at 490 nm (blue/green), and a second at 570 nm (yellow). The third (double peak) lies within the UV band. Houseflies are highly receptive to UV light and specialised UV receptors in the eye are particularly sensitive to wavelengths between 330 and 350 nm (Hardie 1984). However to-date there has been no attempt to determine how houseflies react to colours of these specific wavelengths.

The source of milk contamination

The milk market requires safe and high-quality products, preventing contamination source by good hygiene practices to reduce a possible exposure of food-borne pathogens and chemical milk residues. The mammary gland participates in the excretion of numerous xenobiotic substances from veterinary drug milk residues and contaminants originated from milk and other chemical residues to environmental pollutants on the grasslands, animal feedstuffs, and the field crops

(Velázquez-Ordoñez *et al.,* 2011). The presence of residual concentrations of milk contaminants and pathogens is an indicator of milk quality in cow dairy farms. In evaluating the raw milk bulk tank at the dairy farms, quick information about udder health status, environ-pathogens, milk chemical residues, and antibiotics is obtained (Simsek,*et al*., 2000).

The relationship among dairy cow production and milk safety and dairy product quality is considered in different subjects: raw and pasteurized milk contamination and microbial aspects of the quality of milk and dairy products, cow husbandry in animal welfare influence, feeding conditions, and herd hygiene practices and milk composition. Also the environmental pollutants, and chemicals from agriculture,

Pesticides residues, drug veterinary residues and management in dairy production. Those relationships that exist in milk production are auditable and selectively regulated to prevent milk contaminants. The contaminants agents are tracking and monitored in developed countries, usually at milk parlor, in refrigerated milk tank and the milk bulk tank on platform by the application of proper sampling methods required in the Control Analytical Methods for milk quality in Dairy Industry Management assurance for food safety (Bauman *et al.,* 2018). Are affecting milk production and dairy products related to food safety and milk quality. In the phenomenon of the climatic change, the zoonosis and food-borne diseases are priorities in the public health programs in many countries, ones of the surveillance task is the diseases transmitted by raw milk, and unpasteurized fresh dairy products (FAO.2008). The aflatoxin M1 contamination levels in milk appear to be a serious health hazard derivate from hepatotoxic and carcinogen effects of aflatoxin M1, which show a high risk on milk food safety. The milk contamination risk is established through the forages, corn and concentrated feeds; those are contaminated by aflatoxin B1 (AFB1). There is an aim to watch over the limit exposure to aflatoxins in dairy by imposing regulatory limits (Roussi, *et al.,* 2002). The presence of biotics from grazing cows and conserved pastures and feeding grains, like aflatoxins AFB1 and AFM2, has been usually monitored in milk (Roussi *et al.,* 2002). In dairy production, an important practice is oriented to reduce environment fungal contamination and the proper conserving methods of silages, forages, and grains for animal feed (Tajik *et al.,* 2007). The controlled grazing land is a relevant characteristic of the milk.

The bacterial count is a useful method to measure milk quality, a bacterial count ranging between 9×10 - 9×10^{6} cfu/ml is acceptable (Salman, and Elnasri, 2011), and the mean standard plate count of raw milk is 1.29×10^{6} cfu/ml, (Ramanjaneyulu, and Vyas, 1985) but when milk was pasteurized it was reduced to

1.2×10^{4} cfu/ml. Grade A milk has a count less than 1×10^{5} cfu/ml.

NUTRITIONAL VALUE OF COW MILK

Cow's milk contains, on average,3.4% protein, 3.6% fat and 4.6% lactose, 0.7% minerals (milk contains traces of Ash)and supply 66kcal of energy per 100 grams. Milk fat percentages may be manipulated by dairy farmer's stock diet formulation strategies. Mastitis infections can cause fat level to decline (Tetra pak Dairy index, 2009).

There is resent evidence suggesting consumption of milk is effective in promoting muscle growth. Some studies have suggested that conjugated linoleic acid, which can be found in dairy products is an effective supplement for reducing body fat (Whigham *et al.,* 2007) with ' regards to the claim of milk promoting stronger bones, there has been no association between milk consumption or excess calcium intake (Feskanich, *et. a1.,* 2007) , and a reduced risk of bone fractures.

MATERIALS

Milk Food color (Red, Blue, green, Yellow), Cotton swabs, Petri dish, Droppers,
Measuring cylinder

METHOD

A modified Peet-Grady testing method (Anon. 1943) was implored by pouring 15ml of milk into five (5) different Petridish just enough to cover the bottom and towards the centre of each Petridish 3ml of food color (yellow, white, and blue, green, red). Cotton swab was used in mixing the mixture. The five Petridish with their content were place on the same table outside the laboratory in a shade and the color that attract more flies was noted and the flies counted after 10 minutes of exposure.

RESULT

Table 1: shows the effect of different milk colors to the attraction of house flies

Color	Number of attracted house flies
Blue	12
Green	7
Red	6
White	5
Yellow	2

(Sources: field work)Table 2: shows the effect colors to the attraction of house flies

Color	Number of attracted house flies
Blue	9
Green	8
Red	7
White	4
Yellow	2

(Sources: field work)

Color	Number of attracted house flies
Blue	9
Green	7
Red	4
White	3
Yellow	2

Table 3: shows the different color to the attraction of house flies.
(Sources: field work)

Table 4: the total sum of house flies attracted to different color in the three exposure of 30 minutes each.

Color	Sum of flies attracted to the different colors in 30 minutes	Total number of house flies.
Blue	12+9+9	30
Green	7+8+7	22
Red	6+7+4	17
White	5+4+3	12
Yellow	2+2+2	6

DISCUSSION CONCLUSION AND RECOMMENDATION

The study on approach toward minimizing microbial contamination of milk by flies (Musca domestica) using colour repellant was carried out, and at the end of the experiment it was observed that after 10 minutes of exposure of different colour milk, blue colour milk attracted 12 flies, green colour milk attracted 7 flies, red colour milk attracted 6 flies, white colour milk attracted 5 flies, while yellow colour milk attracted 2 flies as since in table1

Table 2, also shows result after another 10 minutes of exposure with blue colour milk attracted 9 flies, green colour milk attracted 8 flies, red colour milk attracted 7 flies and yellow attracted 2 flies.

At the final 10 minutes of milk exposure (Table 3), shows blue colour milk attracted 9 flies, green colour milk attracted 7 flies, red colour milk attracted 4 flies, while both white and yellow colour milk attracted 3 flies.

However, table 4, shows total number of 30 flies were attracted to blue milk, 22 house flies were attracted to green milk, 17 flies were attracted to red milk, 12 flies were attracted to white milk while 6 flies were attracted to yellow colors.

At the end of total 30 minutes experiment, the study reveals that Blue color attracted more houseflies, while yellow color attracted least houseflies. The result is in disagreement with previous work by Waterhouse, 1948; Hecht, 1963 who observed that Musca domestica preferentially settle on black or red surfaces, and avoid blue or white surfaces.

CONCLUSION

Yellow colour attracted least number of house flies while blue colour attracted high number of house flies.

RECOMMENDATION

Base on the result of this studies, it is hereby recommended that since yellow milk attracted less flies, all milk containers should be painted

yellow to discourage houseflies being attracted towards the milk. However, Blue color should be used as bait to attract the flies in our environment since the color attracted more house flies. If the above recommendations are followed, food and milk contamination by houseflies will be minimized.

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