Open Access

Int. J. Trop. Vet. Biomed. Res.
Vol. 7 (1): 41-45; May 2022

www.jurnal.unsyiah.ac.id/IJTVBR
E-ISSN : 2503-4715

Correlation of The Total Population of Black Soldier Fly *(Hermetia illucens)* Larva with The Population of The House Fly *(Musca domestica) in Chicken Feces*

Azhari[1*], Evan Kurniawan[2], Lian Varis Riandi[3], Winaruddin[3], M. Jalaluddin[4], Etriwati[5]

[1]*Laboratory of Veterinary Public Health, Faculty of Veterinary Medicine, Universitas Syiah Kuala, Banda Aceh*
[2]*Bachelor of Veterinary Medicine, Faculty of Veterinary Medicine, Universitas Syiah Kuala, Banda Aceh*
[3]*Laboratory of Parasitology, Faculty of Veterinary Medicine, Universitas Syiah Kuala, Banda Aceh*
[4]*Laboratory of Anatomy, Faculty of Veterinary Medicine, Universitas Syiah Kuala, Banda Aceh*
[5]*Laboratory Pathology, Faculty of Veterinary Medicine, Universitas Syiah Kuala, Banda Aceh*
**Corresponding author: azhari_63@unsyiah.ac.id*

Abstract

The increase in the house fly population (*Musca domestica*) indicates pollution from chicken farms due to the chicken feces produced. The house fly population from farms can be reduced by using Black Soldier Fly (BSF) larvae, but the exact number of BSF larvae has yet to be discovered to reduce the house fly population. This study aims to determine the presence of BSF larvae in chicken feces waste media in inhibiting the population of house flies. The research sample used 7-day-old BSF larvae from fishing for BSF flies from nature using organic waste to lay eggs and produce larvae. The research method used a completely randomized design (CRD) consisting of 4 treatments and 3 replications. Treatment without the addition of larvae (P0), 100 grams (P1), 200 grams (P2) and 300 grams (P3) into 1 kg of chicken feces stocked in a 50 cm x 50 cm container. The variable observed was the number of house flies perched on each treatment's feces. The results showed that the number of flies that landed on chicken feces with the addition of 0 g, 100 g, 200 g, and 300 g BSF larvae was 34.33±12.09, 22.33±10.21, 16.33 ±2.08 tails, 11.00±2.64 individuals. Based on the results of statistical analysis, it was found that the population of the house fly was significantly reduced ($P<0.05$) between the addition of 0 grams of BSF larvae, 100 grams, 200 grams and 300 grams. The results of the study concluded that the more BSF larvae added, the less population of house flies perched around chicken feces. The presence of BSF larvae weighing 200 g per kg of chicken feces can reduce the population of flies that perch on chicken feces by 52%.

Keywords: Chicken feces, house fly population, black soldier fly larvae population

Background

The management of maintenance, farming, and waste handling of a livestock business must be considered so that the business is not only an efficient production business but also environmentally sound. The Government of the Republic of Indonesia, through the Decree of the Minister of Agriculture No. 237/1991 and the Decree of the Minister of Agriculture No. 752/1994, stated that livestock businesses with specific populations need to be equipped with environmental management and monitoring efforts.

The negative impact on the environment that can result from the production process of a chicken farm is constantly associated with the number of chicken feces produced. Chicken fecal production will increase in line with the size of the livestock business, and if not managed properly, it will cause air, water and soil pollution and can be a place for disease vectors to develop.

Chicken feces are a medium in which the growth of decomposing microbes and pathogens of livestock origin. The stench produced during the process of decomposition of feces by such microbes will invite many flies that come to the place of accumulation of feces to breed. Learmount *et al.* (2002) stated that an area farm is an environment where houseflies can be found in large quantities due to the abundance of organic waste of farm animals so that it provides a place to lay eggs and become a growing medium for housefly larvae, especially in areas with high temperatures and humidity. Hastutiek and Fitri (2007) stated that a large number of 95% of the various types of flies found

around the cage feces are house flies (*Musca domestica*).

The rapid expansion of the housefly population can cause stress for animals and workers on the farm. House flies are considered nuisance insects because they are mechanical vectors of some diseases and cause myiasis in humans and animals. As mechanical vectors, flies carry seeds of the disease through limbs such as hairs on their legs, torso, wings and mouth (Putri, 2015). In addition, House flies can carry and spread disease agents such as the Avian Influenza (AI) virus or bird flu virus (Prasetya *et al*., 2015). These flies are also annoying in terms of aesthetics and tranquillity. According to Andiarsa (2018), this insect can also carry disease agents such as *Escherichia coli* O157:H7, *Salmonella enterica*, *Cronobacter sakazakii*, and *Listeria monocytogenes*.

According to Ambarningrum *et al*. (2020), BSF larvae can be used to convert organic matter because BSF larvae can degrade organic waste, both from animals and plants. In addition, the advantage of BSF is its ability to repel house flies which are vectors of infectious diseases that are numerous in developing countries (Diener *et al*., 2011). However, information about the number (density) of BSF larvae in the feces of chickens with the population of house flies (*Musca domestica*) has yet to be discovered.

Materials And Methods

Research Design

The study used a complete randomized design (RAL) with 4 treatments and 3 tests. The treatment given is the addition of BSF fly larvae to the feces of broiler chickens. The number of BSF fly larvae added for treatment I (P0) is 0 grams (control or without the addition of larvae), treatment II (P2) is 100 g of larvae, treatment III (P3) is 200 g of larvae and treatment IV (P4) is 300 g of larvae. The amount of chicken feces used in each treatment is as much as 1 kg stocked in a container measuring 50 cm x 50 cm. The observations made were the number of house *flies (Musca domestica*) that perched on the feces of chickens in the morning to evening for 7 hours (09.00 – 16.00 WIB). Observation of the number of flies was carried out using adhesive paper (*Fly Trap*) which was placed in the middle of the box on chicken feces (Prasetya *et al*., 2015).

Sample larva BSF

The sample used in this study was broiler chicken feces obtainedfrom broiler farms. Fecal samples are taken from the floor in the chicken coop by 12 kg. The BSF larvae used in this study came from the results of fishing BSF flies from nature to lay eggs on organic media carried out in Gampong Lambitra, Tungkop District, Aceh Besar Regency. Mavailable organic waste used includes fruit and vegetable waste. This waste is placed in 2 buckets with a diameter of 75 cm, then on top of the organic waste media are placed banana leaves that have dried as a place for female BSF flies to lay eggs (Fahmi, 2015). The bucket is closed by giving a gap as a place for the entry of BSF flies. Lthe BSF device will lay its eggs and hatch until it produces larvae. After developing into larvae at the age of (7 days), then separated by filtering by putting the substrate on a sieve wire filter and letting the larvae go down and fall into the container of the reservoir. The collected larvae are ready to be used for research treatment.

Provision of Media (Chicken Feces) and Addition of BSF Fly Larvae

Chicken feces are obtained from a collected broiler chicken coop in fresh (wet) conditions. Feces are laid out in 12 treatment containers (boxes of plywood and wood) with a size of 50 cm x 50 cm. Each container contains 1 kg of chicken feces as a treatment medium for the addition of BSF larvae.

The addition of BSF fly larvae is carried out by placing BSF fly larvae on chicken feces. Next, the larvae are left inside the fecal medium for 1 day before being laid at the observation site. The location of the laying of the observation medium is near the chicken coop.

Data Analysis

Data from the observation of the number of housefly *populations (Musca domestica*) were recorded and observed for 1 day. The results of recording and observations are presented in the form of a table and analyzed using ANOVA, the data differences are then analyzed using the DUNCAN test using the SPSS program.

Results and Discussion

The number of house *flies (Musca domestica*) in chicken feces

The results of the observation of the average number of house flies (*Musca domestica*) that perched on chicken feces obtained during 1 day of observation from each treatment of BSF larval addition can be seen in (Tabel 1).

Tabel 1. The average number of house flies (*Musca domestica*) perched on the feces of chickens treated with the addition of BSF larvae

Treatment number of larvae BSF / (g)	Average number (± Elementary school) house fly (*Musca domestica*) (tail)
P0 (0)	34,33±12.9[a]
P1 (100)	22.33±10.2[ab]
P2 (200)	16.33±2.8[b]
P3 (300)	11.0±2.6[b]

[a,ab,b] The superscript of different letters in the same column shows a noticeable difference ($p<0.05$). Information: P0: 0 g of BSF larvae; P1: 100 g of BSF larvae; P2: 200 g of BSF larvae; P3: 300 g of BSF larvae

In Tabel 1 it was seen that the highest average number of house flies that perched on chicken feces during one day of observation was in the control treatment (without the addition of larvae lalat BSF) which was 34.33±12.09 heads. The high number of house flies perched on chicken feces is due to the potential of chicken feces that are suitable as a breeding medium for house flies (*Musca domestica*). Chicken feces are used as a medium for laying eggs for house flies (*Musca domestica*). Darmawati (2005) explained that the breeding of fly larvae in broiler chicken feces reached 17.73±3.28 heads higher than native chicken feces of 9.27±3.54 heads, goat feces of 8.8±2.04 heads and cow feces of 2.46±2.41 heads.

The habitat lhome appliance (*Musca domestica*) for breeding is in dirty places such as chicken feces and organic waste (decaying vegetables and fruits). Decomposition of proteins in chicken fecal waste will produce hydrogen sulfide and ammonia gases that are correlatedwith au rot. These gases will evaporate and be plieredby the sense of smell of flies so that they will invite flies to come (Nadeak *et al*., 2016).

The population of house flies that perched on the feces of chickens in this study decreased with the increasing number of BSF larvae added in chicken feces. In Table 1, it can be seenthat the lowest housefly population was obtained in the addition of BSF larvae by 300 g, namely 11.00±2.6 heads.

The results of *analysis of varian* (ANOVA) are known that the treatment of adding BSF fly larvae to chicken feces can significantly reduce the number of house flies ($P<0.05$) that perch on chicken feces.

Furthermore, duncan test results found that the treatment of adding BSF larvae by 200 g (P2) and 300 g (P3) could significantly reduce the number of housefly populations ($P<0.05$) compared to controls (without treatment), the addition of 100 g of larvae (P1) could reduce the population of house flies that perched on chicken feces.

This suggests that the presence of BSF larvae can prevent increasing housefly populations perched on chicken feces. The decrease in the number of housefly populations perched on chicken feces as a result of the addition of BSF fly larvae may be due to the movement of BSF fly larvae that are constantly moving inside the feces, thus interfering with the comfort of houseflies to perch and lay eggs in the feces of chickens. In addition, the decline in the housefly population is also due to the ability of BSF larvae to degrade organic matter so that the smell of chicken fecal waste can be reduced.

BSF larvae can decompose organic waste, including manure waste, effectively because the larvae belong to the

detritivorous group, which are plant-eating organisms and animals that have undergone decay. L arva does not cause a pungent odor in decomposing organic waste so that it can be produced in homes or settlements. There was a decrease in volatile compounds in media given black army fly larvae based on observations in the laboratory (Banks *et al*. 2014).

The addition of BSF larvae with more mass is found to be less and less of a population of flies attached to adhesive paper. The rate of decreasing the number of house flies in the treatment of adding BSF larvae by 200 g and 300 g respectively was 52% and 67%, the rate of decrease obtained in this study was lower compared to the report of Tomberlin and Sheppard (2002) stated that BSF colonies that developed in chicken manure were able to reduce the population of house *flies (Musca domestica)* by 94-100%.

BSF fly larvae can grow and thrive on organic media, such as BIS, cow dung, pig manure, chicken manure, fruit litter and other organic waste. The ability of BSF larvae to live in various media is related to their characteristics that can develop at low pH and also high pH (Katayane *et al*., 2014).

Conclusion

Based on the study's results, it was concluded that the higher the mass of BSF larvae in chicken feces, the less the number of housefly populations (Musca domestica) perched on chicken feces. For example, the presence of BSF larvae weighing 200 g can reduce the population of flies perched on chicken feces by 52%.

References

Ambarningrum, T. B., Srimurni, E. and Basuki, E. 2019. Bioconversion technology of household organic waste using black *soldier fly* (BSF) larvae, *Hermetia illucens* (Diptera: stratiomyidae). *LPPM Journal*, 9(1): 235-243.

Andiarsa, D. 2018. Flies: neglected vectors of the program. *Balaba*. 14(2):201-214.

Bank, I.J., Gibson, W.T and Cameron, M.M. (2014). Growth rates of black soldier fly larvae on fresh human faeces and their implication for improfing sanitation. *Tropical Medicin and International Health*. 19(1):14-22.

Darmawati, A. 2005. Rearing (Breeding) larvae of rumah *flies (Musca domestica, Linneus*) on some laboratory cattle fecal media. *Thesis*, Universitas Airlangga

Diener, S., Solano, N.M.S., Gutiérrez, F.R., Zurbrügg, C and Tockner, K. 2011. Biological treatment of municipal organic waste using black soldier fly larvae. *Waste Biomass Valorization*. 2(4): 357-363.

Fahmi, M.R. 2015. Optimization of the bioconversion process by using mini-larvae *of Hermetia illucens* to meet the needs of fish feed. *Pros Of Sem Nas Masy Biodiv Indon.* 1(1): 139-144

Hastutiek, P and Fitri, L.E. 2007. *Musca's potential domestica* Linn. avector of some diseases. *Journal of Medicine*. 23(3):125-136.

Katayane, F.A., Bagau, B., Wolayan, F.R and Imbar, M.R. 2014. The production and protein content of maggots (*Hermetia illucens*) using a different growing medium. *Zootek Journal*. 34(5):27-36.

Learmount, J., Chapman, P and Macnicoll, A. 2002. Impact of insecticide resistance strategy for house fly (Diptera: Muscidae) control in intensive animal units in the Kingdom. *Journal of Economic Entomology*. 95(6):1246-1250.

Nadeak, E.S.M., Rwanda, T and Iskandar, I. 2016. The effectiveness of bait variations in the use of *FLY TRAP* in the Ganet landfill in Tanjungpinang City. *Andalas Journal of Public Health*. 10(1):82-86.

Prasetya, R.D., Yamtana and Amalia, R. (2015). The influence of lamp color variations on fly adhesive devices on the number of trapped house *flies (Musca Domestica*). *BALABA*, 11(1):29-33.

Princess, Y.P. 2015. Species diversity of flies (Diptera) and bacteria on the body of flies in landfills (landfills) and markets. *UNAND Journal of Environmental Engineering*. 12(2):79-89.

Tomberlin, J.K., Sheppard, D.C and Joyce, J.A. 2002. Selected life-history traits of black soldier flies (Diptera: Stratiomyidae) reared on three artificial

diets. *Annals Of the Entomological Society of America*. 95(3): 380-386.