Prevalence and degree of gastrointestinal nematode infection of horses (*Equus caballus*) used as public transport in Mataram city, Indonesia

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Abstract. Horses of *Equus caballus* species which are used as public transportation in the form of Cidomo (traditional horse cart) in Mataram City need to be considered about their welfare and health. A common problem in horses is gastrointestinal nematode worms that can induce negative health effects on horses. Furthermore, the infective larvae of nematodes can survive in the environment under optimum conditions of temperature and humidity. The purpose of this study was to determine the prevalence and degree of infection of gastrointestinal nematodes in horses used as public transportation (Cidomo) in Mataram City. The cross-sectional study was conducted from July to August 2020 to collect feces of Cidomo horses at 8 traditional markets in Mataram City. A total of 131 feces of horses as Cidomo were taken directly from the rectum of Cidomo horses by the purposive method. The Morphology, prevalence of nematode egg, and Egg per gram (EPG) for a degree of infection were used examined using the floating McMaster technique. Morphological data and the prevalence of gastrointestinal nematodes in horses (*Equus caballus*) as Cidomo were presented descriptively, and the EPG value was analyzed by the Anova test, while the degree of infection has been categorized as low, medium, and high levels. The eggs of gastrointestinal nematodes (*Trichosstrongylus* spp, *Strongylus* spp, and *Capillaria* spp) have been found in feces of horses as Cidomo at 8 traditional markets in Mataram City with a prevalence of 74.04% (97/131). The EPG value of the gastrointestinal nematode of feces of horses as Cidomo between 8 traditional markets in Mataram City showed no significant difference with p > 0.05 (p-value = 0.227). Overall the degree of infection of gastrointestinal nematodes in horses (*Equus caballus*) as Cidomo in Mataram City was a medium level with a mean value of EPG = 547.628 ± 82.059 The results showed that the gastrointestinal nematodes have been infected horses as Cidomo in 8 traditional markets in Mataram City with a medium level of infection degree.

Keywords: Gastrointestinal nematode, Infection, Horse, Cidomo, Mataram
1. Introduction
A Cidomo is a small horse-drawn carriage used in the Lombok Island of Indonesia. The name Cidomo is derived from the Sasak word cika or cikar (a traditional handcart). The horses (Equus caballus) are still used as transportation in the form of Cidomo in Mataram City, sometimes Cidomo was used by tourists to around Mataram City so that their health and welfare need to be maintained. Helminthiasis was the major problem in herbivore and Gastrointestinal nematodes are a common cause of helminthiasis [1]. Horses (Equus caballus) as Cidomo very susceptible to infection by gastrointestinal nematode worms because while resting or waiting for passengers they will search for grass carelessly. Data on helminthiasis on horses, especially horses as Cidomo in Maram City have not been reported. Gastrointestinal nematode worms that can be found in horses in tropical climates such as Trichostrongylus axei, Cyathostome sp., Triodont alophorus sp., and Strongylus sp [2]. Data of research in Indonesia which also has a tropical climate showed that Strongylus spp, Cyathostomes spp, Triodontophorus, Strongyloides westeri, Oxyuris equi and Parascaris equorum have been found in Cidomo horses with an overall prevalence of 98% of 50 fecal samples. The species of nematode worms in the gastrointestinal tract such as Trichonema sp., Strongylus sp., and Parascaris equorum were also found in wagons and racehorses in Bangkalan Madura district with a prevalence of 87% [3]. The relatively high prevalence of gastrointestinal nematode worms will certainly greatly affect the health and welfare of horses. The decline in horse health will lead to decreased productivity and reproduction of the horses as Cidomo, especially with a high degree of infection. Lem et al. [3] stated that cases of helminthiasis will lead to decreased work efficiency, poor food utilization, colic, and sometimes death due to blood clots. Adult worms of some types of nematodes can produce toxins that destroy red blood cells, causing anemia. Epidemiologically, the determination of gastrointestinal nematode infection depends on the degree of infection, a high degree of infection will cause the excretion of worm eggs in horse feces to be higher. The eggs will become larvae in the environment, where the larvae will be able to infect horses and other animals, and humans. The interaction between horse and Cidomo coachmen and traders in the market is very likely and can lead to worm transmission between species. Based on these facts, it is necessary to research the prevalence and degree of infection of nematode worms in horses (Equus caballus) as Cidomo in Mataram City to facilitate the planning of prevention of infective larvae in the environment, maintain the health and welfare of horses which have been used as a means of transportation for tourists.

2. Materials and Method
2.1. Study site
The study was conducted at 8 traditional markets in Mataram City. The eight traditional markets are Kebon Roek Market is located at 8°33'55.5"S 116°04'40.7"E, ACC Market is located at 8°34'19.8"S 116°04'36.2"E, Cemara Market is located at 8°34'39.9"S 116°06'40.3"E, Sindu Market is located at 8°34'56.7"S 116°07'47.7"E, Cakranegara Market is located at 8°35'16.6"S 116°07'47.7"E, Karang Jasi Market is Located at 8°35'30.7"S 116°07'12.8"E, Pagesangan Market is located at 8°36'10.3"S 116°06'08.4"E, and Pagutan Market is located at 8°36'41.0"S 116°06'52.1"E. The Location of 8 traditional markets in Mataram City can see in figure 1.
2.2. Study design and sampling method
The cross-sectional study with a purposive sampling method for collect samples was conducted from July to August 2020. The target population in this study is the horses (*Equus caballus*) as Cidomo in Mataram City. The sample size was used formula given by Thrusfield [4] with a 95% confidence interval, expected prevalence of 5%, and desired absolute precision of 4%.

\[
\frac{1.96^2 \cdot P_{exp} (1- P_{exp})}{d^2} = n
\]

Where, \( n \) = sample size; \( P_{exp} \) = expected prevalence; \( d^2 \) = desired absolute precision.

Based on calculation and according to Pourhoseingholi et al. [5], the estimated sample size was 114 horses, to increase the precision 17 horses were added and a total of 131 horses were sampled.

2.3. Collection and examination of fecal samples
A total of 131 feces of horses (*Equus caballus*) as Cidomo were taken directly from the rectum by the purposive method. The feces are then put into a labeled plastic bag as much as 20 grams. The sample is then put in a cool box and taken to the Equine Clinical Center laboratory of the Mandalika University of Education to be stored in a refrigerator before further examination. The modified Floatation techniques according to Abebe et al. [6] were conducted to identify eggs of nematodes using flotation fluid McMaster slide. The slide prepared was examined under a microscope (10x-40x). Eggs of the different nematodes were identified based on morphological appearance and size of eggs. Mac Master egg counting technique was also done for positive samples to Egg per gram (EPG) of nematode egg and categorize the degree of the infection level. The degree of infection levels was divided into three groups based on high, medium, and low levels of egg content (201–500, 501–1000 and 1001+eggs/g) as described by Slusarewicz et al. [7]

2.4. Statistical analysis
Morphological data and the prevalence of gastrointestinal nematodes in horses (*Equus caballus*) as Cidomo presented descriptively. The EPG value of the gastrointestinal nematode of feces of horses as Cidomo between 8 traditional markets analyzed by the *Analysis of variance* (ANOVA) test with a p-value less than 0.05 was considered as statistically significant. The degree of infection has been categorized as low, medium, and high levels as described by Slusarewicz et al. [7]
3. Results and Discussion

The eggs of gastrointestinal nematodes were found in 97 faces of 131 samples collected from horses (Equus caballus) as Cidomo at 8 traditional markets in Mataram City. This research was identified Trichostrongylus spp, Strongylus spp, and Capillaria spp from the feces of Cidomo horses using the Mc Master slide. The morphology of Trichostrongylus spp, Strongylus spp, and Capillaria spp in Mc Master slide can see in Figure 2.

![Figure 2. a) Trichostrongylus spp, b) Strongylus spp, b) Capillaria spp (40x)](image)

Figure 2 showed that Trichostrongylus spp eggs are ellipse in shape, colorless with thin-shelled and they had 70 – 80 µm long. Strongylus spp had 50 - 70 µm long and Capillaria spp had 30 - 40 µm long, which contains worm larvae. The overall prevalence of gastrointestinal nematodes in horses (Equus caballus) as Cidomo during the research period was 74.04% (97/31). The EPG value of 97 positive of 131 feces samples can see in Table 1.

| Location             | Number of Samples | EPG Mean ± SE     | p-value |
|----------------------|------------------|-------------------|---------|
| Kebon Roek Market    | 33               | 838.787 ± 169.971*|         |
| ACC Market           | 10               | 428.000 ± 228.622*|         |
| Cemara Market        | 11               | 341.818 ± 161.660*|         |
| Sindu Market         | 7                | 205.714 ± 68.412*  | 0.227   |
| Cakranegara Market   | 4                | 90.000 ± 30.000*  |         |
| Karang Jasi Market   | 8                | 195.000 ±77.620 a  |         |
| Pagesangan Market    | 17               | 602.352 ± 187.340*|         |
| Pagutan Market       | 7                | 542.857 ±228.622 a |         |
| Total                | 97               | 547.628 ± 82.059 a |         |

Different low case letters in the same column indicate statistically different Values (p < 0.05)

Table 1 showed that the EPG of gastrointestinal nematodes feces of horses (Equus caballus) as Cidomo at 8 traditional markets in Mataram City were variable (90.000 - 838.787). The result of the ANOVA test of the EPG value of the gastrointestinal nematode from horses between 8 traditional markets in Mataram City showed no significant difference with p > 0.05 (p-value = 0.227). Based on the EPG value, the degree of infection of gastrointestinal nematodes at horses as Cidomo in Mataram City was a medium level with a mean value of EPG = 547.628 ± 82.059.

The morphology of Trichostrongylus spp eggs was similar to the morphology with Trichostrongylus spp that infected humans in Brazil [8] but Trichostrongylus spp smaller. The length of Strongylus spp in this research is smaller than Strongylus spp were documented with Febriyanti et al [9] that which had an average size of 82.230x44.245µm. The length of Capillaria spp of this research is relatively smaller than Capillaria spp that documented by Fugassa et al. [10].

The prevalence value of gastrointestinal nematodes by 74.04% in horses as Cidomo in this research was almost similar with Apriliawati et al [3] that reported racehorses in the Bangkalan Madura district had infected with gastrointestinal nematodes by a prevalence of 87% but higher than nematodosis that reported by Febriyanti et al [9] which showed the prevalence of nematodosis of Crossbreed Horse in
Detasemen Kaveleri Berkuda Parongpong Bandung was 12.03% of 108 samples collected. Variability of prevalence will be related to the degree of infection of gastrointestinal nematodes in Cidomo horses in Mataram City was a medium level. The prevalence and degree of infection of gastrointestinal nematodes in horses due to the availability of anthelmintics.

The low prevalence of nematodosis in Detasemen Kaveleri Berkuda Parongpong Bandung was caused by the routine administration of anthelmintics [9]. The routine administration of anthelmintics will be to decrease the degree of infection. Administration of anthelminthic must be careful because can cause the resistance of Nematodes that increased of prevalences. Kholik et al. [11] reported that gastrointestinal worms of Bali cattle on Lombok Island were resistant to Albendazole. The variability of this prevalence and degree of infection also can be caused by geographical and climatic conditions. Mataram City and Bangkalan Madura had the most similar climatic and geographical but in Bandung City, the climate is cooler with mountainous conditions. Girma et al. [12] reported that The climatic condition where rainfall is frequent and the temperature is mild can develop and survive infective larvae for most of the years. No significant difference (p > 0.05 ) of The Egg per gram (EPG) value of the gastrointestinal nematode of feces of horses (Equus caballus) as Cidomo between 8 traditional markets in Mataram City may because of the all market in one climatic and geographical condition. The medium level of degree of infection of gastrointestinal nematodes in 8 traditional markets in Mataram City because of no routine administration of anthelmintics.

4. Conclusion
Based on the results, the gastrointestinal nematodes such as Trichosstrongylus spp, Strongylus spp, and Capillaria spp have been infected horses (Equus caballus) as Cidomo in 8 traditional markets in Mataram City with high prevalence in a medium level of infection degree. Administration of anthelmintics for Cidomo horses in 8 traditional markets was needed to control infective larvae in the environment and maintain the health and welfare of horses which have been used as transportation in Mataram City.

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