Journal on Biology and Instruction
Vol. 2 No. 1 Tahun 2022 | 1 – 8
ISSN 2978-0863

Prevalence and intensity of parasitic worm eggs of bali cow (*Bos sondaicus* Muller) feces from two different shed sanitations

Hafidz Uddin Hidayat [a,1], **Nurul Suwartiningsih** [b,2,*]

[a] Program Studi Biologi, Universitas Ahmad Dahlan Kampus IV, Jl. Tamanan, Banguntapan, Bantul, 55166 Indonesia
[b] Laboratorium Ekologi dan Sistematika, Program Studi Biologi, Universitas Ahmad Dahlan Kampus IV, Jl. Tamanan, Banguntapan, Bantul, 55166 Indonesia
[1] hafidz1700017032@webmail.uad.ac.id; [2] nurul.suwartiningsih@bio.uad.ac.id *
*corresponding author

Article information

Article history
Received October 31, 2021
Revised June 12, 2022
Accepted June 30, 2022

ABSTRAK

Sapi Bali (*Bos sondaicus* Muller) merupakan sapi yang banyak dipelihara. Sanitasi kandang sapi yang kurang baik salah satunya diakibatkan oleh feses sapi yang tidak dibersihkan, dan menjadi media penularan parasit cacing saluran pencernaan. Penelitian ini bertujuan membandingkan prevalensi, intensitas dan derajat infeksi telur cacing parasit pada feses Sapi Bali dari dua sanitasi kandang yang berbeda yaitu dari kandang dengan sanitasi kurang baik dan dari kandang dengan sanitasi yang baik. Telur cacing parasit dipisahkan dari feses dengan metode apung dan dengan metode sedimentasi. Hasil penelitian menunjukan 15 dari 16 ekor sampel Sapi Bali terdapat parasit dengan jumlah total 43 telur cacing. Jumlah parasit yang didapatkan dari sampel feses Sapi Bali dari kandang dengan sanitasi kurang baik lebih tinggi (31 telur cacing) daripada yang didapatkan dari sampel feses Sapi Bali dari kandang dengan sanitasi baik (12 telur cacing). Prevalensi, intensitas dan derajat infeksi parasit yang didapatkan dari sampel feses Sapi Bali dari kandang dengan sanitasi kurang baik lebih tinggi dari pada yang didapatkan dari sampel feses Sapi Bali dari kandang dengan sanitasi baik. Hasil penelitian menunjukkan bahwa satinasi kandang yang kurang baik mempertinggi peluang sapi terinfeksi parasit sehingga prevalensi, intensitas dan derajat infeksi telur cacing parasit juga tinggi.

Kata kunci:
Intensitas
Prevalensi
Sapi Bali
Telur cacing parasit

ABSTRACT

Bali cow (*Bos sondaicus* Muller) is a cow that is widely maintained. Poor sanitation of cowshed is caused by cow feces that are not cleaned, and become a medium of transmission of gastrointestinal worm parasites. The study aimed to compare the prevalence, intensity and degree of infection of parasitic worm eggs in the feces of Bali cows from two different shed sanitation, from a shed with poor sanitation and a from shed with good sanitation. The eggs of parasitic worms are separated from feces by buoyant methods and by sedimentation methods. The results showed that 15 out of 16 samples of Balinese cows contained parasites with a total of 43 worm eggs. The number of parasites obtained from Bali cow feces samples from shed with poor sanitation is higher (31 worm eggs) than that obtained from a well-sanitized shed (12 worm eggs). The prevalence, intensity and degree

Keywords:
Intensity
Prevalence
Bali Cow
Parasitic worm egg

of parasitic infection obtained from Bali cow feces samples from a shed with poor sanitation were higher than those obtained from a shed with good sanitation. The results showed that poor shed sanitation increased the chances of cows being infected with parasites so that the prevalence, intensity and degree of infection of parasitic worm eggs were also high.

INTRODUCTION

Bali cow (*Bos sondaicus* Muller) is one of the broiler cows native to Indonesia (Fachroerrozi, 2015) which is distinctive because it comes from the domestication of bulls (*Bibos banteng*) (Kendran et al., 2012). These cows belong to the Bibovine group (*Bibos bull, Bos javanicus* and *Bos sondaicus* (Astiti, 2018). Many advantages possessed by Bali cow include high reproductive ability (Budiarto et al., 2013) and good growth and adaptation (Astiti, 2018). This advantage causes Bali cows to be widely raised in Indonesia (Astiti, 2018). In addition to its advantages, Bali cows also have disadvantages, including being very susceptible to gastrointestinal parasitic infections (Purwaningsih et al., 2017).

One of the parasites that infect the digestive tract of Bali cow is worms. Putra et al. (2014) reported that Bali cow in Sobangan, Mengwi, Badung, Bali were infected with Trematoda worms with a prevalence of 27%. The Trematode worm found is *Fasciola* spp. and *Paramphistomum* spp. Meanwhile, Fadli et al. (2014) reported that the Bali cow in Sukoharjo was infected with Nematode worms with a prevalence of 21%. Nematode worms found are *Trichuris ovis*, *Trichostringylus axei, Toxocara vitulorum, Strongyloides papillosus*, *Nematodirus filicollis, Chabertia ovina*, and *Bunostomum phlebotomum*. These parasitic worms have an economic impact because they reduce the productivity of livestock (Tantri et al., 2013).

The presence of worms that infect the digestive tract of Bali cow can be caused by poor feed and maintenance environment (Purwaningsih et al., 2017). Poor sanitation of cowshed, one of which is caused by cow feces that are not cleaned (Supriadi et al., 2020). This feces can be a medium of transmission of worms that parasitize in the gastrointestinal tract because they contain worm eggs (Zulfikar et al., 2017). This study aims to compare the prevalence, intensity and degree of infection of parasitic worm eggs in Bali cow feces from two different shed sanitation, from shed with poor sanitation and from shed with good sanitation. This research is important to provide information to the public about the importance of maintaining shed sanitation.

METHOD

The tools used are a cooling box to carry fecal samples, digitital scales to weigh feces, a light microscope to observe parasite worm eggs, a Universal Whitlock Counting Chamber counter glass to count parasite worm eggs, an Optilab microscope camera to document observed parasite worm eggs, a 30 mL measuring cup, a 100 mL beaker glass, a mortar, a stirring device, a drip pipette, a sieve, aluminum foil, and a spatula to separate the eggs from the feces. While the materials used are fresh cow feces from two pens with different sanitation, sample plastic to store samples to be taken to the laboratory, Methylene blue 1% for dyes in the sedimentation method, saturated sugar solution for the buoyancy method, newspapers, latex gloves, sterile aqueducts, alcohol, and wipes.

The residents' cows to be taken feces were randomly selected as many as 8 cows from the shed with poor sanitation in Village X and 8 cows from the shed with good sanitation in Ngablak Village, Magelang, Central Java. Cow feces are taken that are still fresh or those that have just come out of the cow's rectum as much as approximately 10 grams. The cow's fecal sample is then put into a plastic clip and labeled. The fecal sample was then taken using a cooling box and observed in the laboratory.

The separation of parasite worm eggs is carried out by two methods, the buoyancy method and the sedimentation method based on Pali and Hariani (2019). The separation of eggs of parasitic worms by the buoyancy method is carried out by means of feces taken as much as 3 g, sterile aquedest of 7 mL is added, 60 mL of saturated sugar is added, and stirred in a mortar until homogeneous using a stirring rod. After the solution is homogeneous, it is filtered using a sieve. The sample solution is taken 0.5 mL with a pipette and dripped onto the glass of the Universal Whitlock Chambers counter (each one chamber has a volume of 0.5 mL). The sample solution is left for 2-3 minutes so that all the worm eggs float on the surface of the liquid. The sample solution was observed with a light microscope and an Optilab microscope camera with a magnification of 100x. The observed eggs are subsequently documented and identified.

The separation of worm eggs by the sedimentation method is carried out by means of feces as much as 3 g weighed, put in a mortar, 60 mL sterile aquedest is added, stirred until homogeneous and then put into a tube. Sterile aquedest is added to the brim and allowed to incubation for 3 minutes. The liquid at the top is discharged and at the bottom or sediment is left approximately 15 mL. The procedure is repeated three times per one feces sample. Methylene blue 1 % dripped as much as 1 drop then stirred thoroughly. The suspension is further taken with a pipette and dripped onto the glass of the Universal Whitlock Chamber counter. The sample solution was observed with a light microscope and an Optilab microscope camera with a magnification of 100x. The observed eggs are subsequently documented and identified.

Eggs that have been identified are calculated for the prevalence, intensity and degree of infection. The prevalence value is the percentage of infected samples divided by the number of samples examined (Suastini et al., 2021). The intensity value is calculated by the formula of the number of parasites found divided by the number of infected cows (Tantri et al., 2013). The degree of infection is calculated by the formula of the number of eggs found per gram of feces (Zalizar, 2017).

RESULTS AND DISCUSSION

The results of observations on Bali cow feces obtained from two locations, from poor shed sanitation in Village X and from good shed sanitation in Ngablak Village, Magelang, Central Java showed that 15 of the 16 Bali cow samples had parasite worm eggs with a total number of 43 worm eggs. The number of parasite worm eggs obtained from Bali cow feces samples from poorly sanitized shed was higher (31 worm eggs) than those obtained from Bali cow feces samples from good shed sanitation (12 worm eggs) (Table 1), but did not differ statistically (sign. > 0.05 at a confidence level of 95%).

Table 1. Species and number of parasite worm eggs found in bali cow feces from two different sanitary shed

Location	Number of Parasite (worm eggs)			Total
	***Strongyloides* sp.**	***Fasciola* sp.**	***Paramphistomum* sp.**	
Poor shed sanitation	12	18	1	3
Good shed sanitation	5	7	0	12

The prevalence of parasites obtained from Bali cow feces samples from poor shed sanitation is higher (100%, always category/ very severe infection) than that obtained from Bali cow feces samples from good shed sanitation (87.50%, usually category/ moderate infection). The intensity of parasites obtained from Bali cow feces samples from poor shed sanitation is higher (4 worm eggs/ cow) than that obtained from fecal samples Balinese cows from good shed sanitation (2 worm eggs/ cow) although both fall into the low category. Data on the prevalence and intensity of parasites obtained from fecal samples of Bali cow from two different shed sanitations can be seen in Table 2.

Table 2. Prevalence and intensity of parasitic worm eggs found in bali cow feces from two different shed sanitations

Location	Infected cows (cow)	Parasite (worm egg)	Prevalence (%)	Category	Intensity (worm egg/ cow)	Category
Poor shed sanitation	8	31	100	Always (very severe infection)	4	Low
Good shed sanitation	7	12	87.50	Usually (moderate infection)	2	Low

The results of observations of Bali cow feces obtained from two locations showed that the degree of infection of parasitic worm eggs from shed cage sanitation was higher (27.92 ± 32.70 wormg eggs / gram) than from good shed sanitation (11.25 ± 20.07 worm eggs / gram) (Table 3) although all of them were still classified as low categories and did not differ significantly (sign. > 0.05 at a confidence level of 95%).

Table 3. Degree of infection of parasitic worm eggs found in bali cow feces from two different shed sanitations

Location	Degree of Infection (worm egg/ gram)			Mean ± Std
	***Strongyloides* sp.**	***Fasciola* sp.**	***Paramphistomum* sp.**	
Poor shed sanitation	60.00 ± 37.03	22.50 ± 10.35	1.25 ± 3.54	27.92 ± 32.70
Good shed sanitation	25.00 ± 29.76	8.75 ± 8.34	0.00 ± 0.00	11.25 ± 20.07

The number, prevalence, intensity, and degree of infection of parasitic infections in Bali cow fecal samples from poor shed sanitation were higher than fecal samples from good shed sanitation. Shed sanitation is influenced by several things such as shed cleanliness, fly density, location and shed construction (Zuroida & Azizah, 2018). Poor cleanliness of the shed is partly caused by cow feces that accumulate and are not cleaned (Supriadi et al., 2020). This cow's feces is a medium of transmission of parasitic worms in the digestive tract because it contains the eggs of worms (Zulfikar et al., 2017). Therefore, poor shed sanitation can trigger parasitic worm infection in cows (Majawati & Matatula, 2018).

This is reinforced by the opinion of (Supriadi et al., 2020) who stated that the cleanliness of the shed is the main factor of sanitation. Poor sanitation leads to the continued life cycle of worms so that it is easier to transmit to other individuals. This factor is what causes shed with poor sanitation to have a higher number, prevalence, intensity, and degree of parasitic infections.

The shed with poor sanitation in Village X (Figure 1) has a building construction made of wood, not permanent and sturdy materials. The floor of the stall is only from the soil so that the cow's feces are difficult to clean due to mixing the soil. The roof part of the coop uses only rumbia leaves. The shed does not have irrigation canals or ditches to drain water and sewage. Water and sewage are drained directly into the river. Cage cleaning is also rarely carried out. Cowsheds should be cleaned twice a day (Zuroida & Azizah, 2018). There are many flies found around the shed. These flies can breed because there are feces of livestock that are deposited and not cleaned (Zuroida & Azizah, 2018).

Figure 1. Poor shed sanitation (personal documentation)

The shed sanitation at the cow farm in Ngablak Village, Magelang, Central Java is relatively good (Figure 2). The shed is made of a strong construction of a permanent building of cement and brick. The floor of the shed is made of hard material, so it is easy to clean, not slippery and can still support the load of cow. The roof of the stall uses a galvalume roof so that cows are protected from rain and sunlight. This shed has an irrigation canal or ditch that serves to collect water left over from cleaning cows and livestock wastewater, which is then discharged into the sewer and channeled towards the biogas reservoir. This is in accordance with the opinion of Zuroida and Azizah (2018) that a good shed has a permanent roof and floor construction. Permanent flooring makes the shed easy to clean. In addition, a good shed also has drainage to drain waste into the waste reservoir for further processing into biogas and manure.

Figure 2. Good shed sanitation (personal documentation)

The results of the study obtained three species of worms, namely *Strongyloides* sp., *Fasciola* sp. and *Paramphistomum* sp. Nugraheni et al. (2018) research on cow feces in the Progo River Basin of Yogyakarta also obtained several species of worms, namely *Fasciola* sp., *Strongyloides* sp., *Paramphistomum* sp., and *Coccidia* sp. Aryandrie et al. (2015) found liver flukes (Fasciola hepatica) from Bali cow feces in Sukoharjo, Pringsewu, Lampung with a prevalence of 27.62%. Putra et al. (2014) found Trematoda worms (*Fasciola* spp. and *Paramphistomum* spp.) from Bali cow feces in Sobangan, Mengwi, Badung, Bali. Meanwhile, Fadli et al. (2014) found Nematode worms (*Trichuris ovis, Trichostringylus axei, Toxocara vitulorum, Strongyloides papillosus, Nematodirus filicollis, Chabertia ovina,* and *Bunostomum phlebotomum*) from Bali cow feces in Sukoharjo.

Based on Tables 1 and 2, the numbers, the prevalence and intensity of Fasciola sp. in both shed is the highest among other parasites. This is similar to the results of a study by Nugraheni et al. (2018) which also found Fasciola sp. with the highest prevalence (40%) compared to other species of worm from cow feces in the Progo River Basin of Yogyakarta. Nugraheni et al. (2018) explained that the high prevalence of worm is because the shed that are closed to the river and cow food are forage that come from the river. The high number, prevalence and intensity of eggs of the parasitic worm Fasciola sp. in both shed in this study, it was also based on the dietary factors consumed by cows, namely forage. Forage, especially those related to waters, is the main medium for the entry of metasercaria of Fasciola sp. Metacercaria enters the body of cows through contaminated food and drink. The metacercaria further enters the intestine, penetrating the intestinal mucosa, up to the abdominal cavity even to the liver. In the liver, adult worms cause tissue damage, causing bleeding and damage to the bile epithelium(Asmaydo et al., 2019). Forage is also the place of settlement of the snail Lymnea sp. as an intermediate host. This intermediate host also played a role in the spread of *Fasciola* sp. (Noviyanti et al., 2020)

Although based on number, prevalence and intensity (Tables 1 and 2), Fasciola sp. shows the highest yield but based on the degree of infection, *Strongyloides* sp. shows the highest yield (Table 3). *Strongyloides* sp. is a kind of Nematodes. *Strongyloides* sp. can enter the cow's body by penetrating the surface of the skin and peroral (Ramadhan et al., 2018) so that infection with these worm larvae is easy to occur (Ariawan et al., 2018). Unclean shed as well as accumulated dirt also increase the chances of infection with these worms. The symptoms caused by this worm are dermatitis, cough, pneumonitis if the larvae enter the lungs (Ariawan et al., 2018).

*Strongyloide*s sp. egg obtained during the observations measured 87.38 µm long and 31.18 wide µm (Figure 3). The egg has an oval shape, thin walls and appears to have worm embryos. This is in line with Triani's 2014 opinion which states that *Strongyloides* sp. eggs are oval with thin walls and inside there are larvae. *Strongyloides* sp. often referred to as thread worms because these have a larval shape resembling threads. The eggs of these worms are produced by adult animals and excreted through feces. Inside the feces, the eggs will hatch into larvae 1 (L1). These larvae then develop into L2-L4 and then become rhabditiform larvae. After 12-24 hours, the larva will become an infectious and free-living filariform (Suastini et al., 2021).

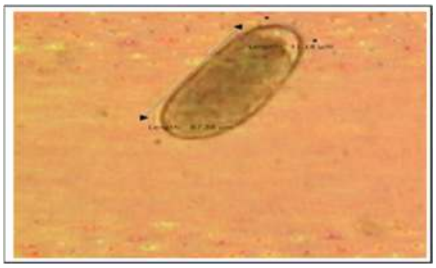

Figure 3. *Strongyloides* sp. egg (Personal documentation)

The Trematode worm that infects cows in both shed is *Fasciola* sp. and *Paramphistomum* sp. Fasciola sp. egg measured was 65.14 µm long and 134.44 µm wide (Figure 4) with oval-shaped and golden-yellow characteristics. These characteristics are in accordance with the opinion of Majawati and Matatula (2018) who stated that *Fasciola* sp. egg was ovoid-shaped, there is a operculum in one of the side and is yellowish in color. While the *Paramphistomum* sp. egg measured was 48.14 µm long and 109.76 µm wide (Figure 5) with characteristics an elliptical shape, bluish in color and has a protrusion at the end of the egg. This is in accordance with the opinion of Putra et al. (2014) which states the eggs of *Paramphistomum* sp. bluish in color as well as having an operculum.

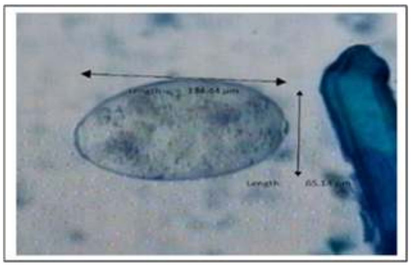

Figure 4. *Fasciola* sp. egg (Personal documentation)

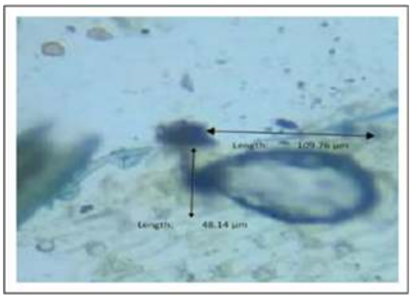

Figure 5. *Paramphistomum* sp. egg (Personal documentation)

Helminthiasis is a disease that often affects farm animals. Helminthiasis is mostly caused by several factors such as poor sanitation and weak resistance of cows to worm parasites. Cows raised in shed with poor sanitation in Village X have the characteristics of relatively thinner bodies compared to those raised in shed with good sanitation in Ngablak Village, Magelang, Central Java. This is in accordance with the characteristics of farm animals infected with worm egg parasites: thinness, lack of appetite, diarrhea, and dull hair. According to Awaludin et al. (2021) the clinical symptom of cows that experience helminthiasis are dull, thin hair and foul-smelling feces (Awaludin et al., 2021). Prevention against parasitic infections can be carried out by giving anthelmintic drugs periodically and in accordance with the recommended dosage. According to Anorital (2014), the anthelmintic used are generally albendazol and mebendazol. The drug is also used to treat parasites of whipworm (*Tricuris* sp.), hookworm (*Ancylostoma* sp.) and roundworm (*Ascaris* sp.). Another prevention is by maintaining the hygiene of the shed and providing forage feed that has been served so as to break the life cycle of parasitic worms (Awaludin et al., 2021).

CONCLUSION

The conclusion of this study is that the prevalence and intensity of parasitic worm eggs found in Bali cow feces from poor shed sanitation (prevalence 100%, always category/ very severe infection; intensity 4 eggs/ cow) is higher than that obtained from Bali cow feces samples from shed with good sanitation (prevalence 87.50%, category usually/ moderate infection; intensity 2 eggs/ cow). The degree of infection of parasitic worm eggs found in Bali cow feces from poor shed sanitation was higher (27.92 ± 32.70 eggs/ gram) than from good shed sanitation (11.25 ± 20.07 eggs/ gram) although it did not differ significantly. Eggs of parasitic worms found in Bali cow feces from shed with poor sanitation (Village X) and from shed with good sanitation (Ngablak Village, Magelang, Central Java) are from *Strongyloides* sp., *Fasciola* sp. and *Paramphistomum* sp.

REFERENCES

Anorital. (2014). Kajian Penyakit Kecacingan Hymenolepis Nana. Jurnal Biotek Medisiana Indonesia, 3(2), 37–47.

Ariawan, K. Y., Apsari, I. A. P., & Dwinata, I. M. (2018). Prevalensi Infeksi Nematoda Gastrointestinal pada Sapi Bali di Lahan Basah dan Kering di Kabupaten Badung. Indonesia Medicus Veterinus, 7(4), 314–323. https://doi.org/10.19087/imv.2018.7.4.314

Aryandrie, D. F., Santosa, P. E., & Suharyati, D. S. (2015). TINGKAT INFESTASI CACING HATI PADA SAPI BALI DI KECAMATAN SUKOHARJO KABUPATEN PRINGSEWU PROVINSI LAMPUNG Liver Fluke Infestation Level of Bali Cattle in Sukoharjo Sub-District Pringsewu Regency Lampung Province. Jurnal Ilmiah Peternakan Terpadu, 3(3), 134–139.

Asmaydo, D., Hamid, I. S., Yunus, M., Kusnoto, K., Sukmanadi, M., & Suprihati, E. (2019). The Anthelmintics Activity of Ethanol Extract of African Leaf (Vernonia amygdalina) on Mortality of Fasciola gigantica in Vitro. Journal of Parasite Science, 3(1), 15. https://doi.org/10.20473/jops.v3i1.16426

Astiti, N. M. ayu G. R. (2018). Sapi Bali dan Pemasarannya.

Awaludin, A., Hasanah, N., Nurkholis, Nusantoro, S., Kustiawan, E., & Wahyono, N. D. (2021). Pencegahan Helminthiasis Pada Ternak Sapi Di Kelompok Ternak Sido Makmur Jember. Jurnal Ilmiah Fillia Cendekia, 6(1), 1–5.

Budiarto, A., Hakim, L., Suyadi, Nurgiartiningsih, V. M., & Ciptadi, G. (2013). Natural Increase Sapi Bali di Wilayah Instalasi Populasi Dasar Propinsi Bali. Jurnal Ternaktropika, 14(2), 46–52.

Fachroerrozi, H. (2015). Pengaruh Keberhasilan Inseminasi Buatan (Ib) Antara Sapi Bali Dara Dengan Sapi Bali Yang Pernah Beranak Di Kecamatan Pemayung Kabupaten Batanghari. Jurnal Ilmiah Universitas Batanghari Jambi, 15(4), 20–27.

Fadli, M., Oka, I. B. M., & Suratna, N. A. (2014). Prevalensi Nematoda Gastrointestinal pada Sapi Bali yang Dipelihara. Indonesia Medicus Veterinus, 3(5), 411–422.

Kendran, A. A. S., Damriyasa, I. M., Dharmawan, N. S., Ardana, I. B. K., & Anggreni, L. D. (2012). Blood Clinical Chemistry Profiles of The Bali Cattle. Jurnal Veteriner, 13(4), 410–415.

Majawati, E. S., & Matatula, A. E. (2018). Artikel Penelitian Pengaruh Tekanan Telapak Kaki Bagian Depan terhadap Pemakaian Hak Tinggi dan Indeks Tubuh Mahasiswi FKUI 2011 Identifikasi

Telur Cacing Massa Fasciola pada Sapi di Peternakan Sapi Daerah Tangerang Kedokteran Alamat Korespondensi Mahasis. Jurnal Kedokteran Meditek, 24(68), 60–66.

Noviyanti, Tethool, A. N., Purwaningsih, Satrija, F., & Murtini, S. (2020). Siput Lymnaea sp. Sebagai Inang Perantara Cacing Trematoda di Distrik Prafi, Manokwari, Papua Barat. Jurnal Veteriner, 21(3), 435–442. https://doi.org/10.19087/jveteriner.2020.21.3.435

Nugraheni, Y. R., Priyowidodo, D., Prastowo, J., Rohayati, E. S., Sahara, A., & Awaludin, A. (2018). PARASIT GASTROINTESTINAL PADA SAPI DI DAERAH ALIRAN SUNGAI PROGO YOGYAKARTA. Jurnal Ilmu Peternakan Terapan, 1(2), 46–50.

Pali, E., & Hariani, N. (2019). Prevalensi Dan Intensitas Telur Cacing Parasit Gastrointestinal Pada Ternak Babi (Sus scrofa domesticus L.). Jurnal Bioterdidik, 7(4), 69–80.

Purwaningsih, P., Noviyanti, N., & Putra, R. P. (2017). Distribusi dan Faktor Risiko Fasciolosis pada Sapi Bali di Distrik Prafi, Kabupaten Manokwari, Provinsi Papua Barat. Acta VETERINARIA Indonesiana, 5(2), 120–126. https://doi.org/10.29244/avi.5.2.120-126

Putra, R. D., Suratma, N. A., & Oka, I. B. M. (2014). Prevalensi Trematoda pada Sapi Bali yang Dipelihara Peternak di Desa Sobangan, Kecamatan Mengwi, Kabupaten Bandung. Indonesia Medicus Veterinus, 3(5), 394–402. http://download.portalgaruda.org/article.php?article=337695&val=974&title=Prevalensi Trematoda pada Sapi Bali yang Dipelihara Peternak di Desa Sobangan, Kecamatan Mengwi, Kabupaten Badung

Ramadhan, M. E., Hartono, M., Suharyati, S., & Santosa, P. E. (2018). Prevalence of Gastrointestinal Helminths on Balinese Cattle in Candipuro District, South Lampung Regency M. Jurnal Riset Dan Inovasi Peternakan, 2(3), 1–9.

Suastini, N. K., Apsari, I. A. P., & Suratma, N. A. (2021). Prevalence of Strongyloides Sp Infection in Bali Cattle in Mengwi Badung and Baturiti Tabanan of the Bali Province. Indonesia Medicus Veterinus, 10(2), 170–179. https://doi.org/10.19087/imv.2021.10.2.170

Supriadi, Kutbi, M. K., & Nurmayani, S. (2020). IDENTIFIKASI PARASIT CACING NEMATODA GASTROINTESTINAL PADA SAPI BALI (Bos sondaicus) DI DESA TAMAN AYU KABUPATEN LOMBOK BARAT. Bioscientist : Jurnal Ilmiah Biologi, 8(1), 58–66.

Tantri, N., Setyawati, T. R., & Khotimah, S. (2013). Prevalensi dan Intensitas Telur Cacing Parasit pada Feses Sapi (Bos Sp.) Rumah Potong Hewan (RPH) Kota Pontianak Kalimantan Barat. Jurnal Protobiont, 2(2), 102–106. http://jurnal.untan.ac.id/index.php/jprb/article/view/2753/2731

Zalizar, L. (2017). Helminthiasis saluran cerna pada sapi perah. Jurnal Ilmu-Ilmu Peternakan, 27(2), 116–122. https://doi.org/10.21776/ub.jiip.2017.027.02.01

Zulfikar, Umar, S., Farasyi, T. R., & Tafsin, M. (2017). Hubungan Lingkungan Dengan Tingkat Infestasi Nematoda Gastrointestinal Pada Sapi di Aceh. Serambi Engineering, II(3), 118–123.

Zuroida, R., & Azizah, R. (2018). Cages Sanitation and Health Complaints Among Dairy Farmers in Murukan Village, Jombang. Jurnal Kesehatan Lingkungan, 10(4), 434–440. https://doi.org/10.20473/jkl.v10i4.2018.434-440