Estimating the production losses related to fasciolosis in water buffaloes in Türkiye

Research Article

ABSTRACT

This study aimed to estimate the annual production losses related to fasciolosis in water buffaloes in Türkiye. Some official data and prices were used in the analysis and the mean prevalence of the disease in water buffaloes was calculated as 6.9% in Türkiye. Estimated loss analysis was performed for meat losses, milk losses, liver losses, and extended calving intervals. As a result, the total production losses were estimated as US$ 1,007,918 in 2024 year at current prices. The highest loss was estimated for the extended calving interval (US$ 492,658) and the lowest was for the condemned liver (US$ 48,021). In conclusion, the magnitude of the losses may provide producers and policymakers with quantitative decision support for preventing and eradicating fasciolosis in water buffaloes in Türkiye.

Keywords: Cost, fasciolosis, losses, Türkiye, water buffalo.

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INTRODUCTION

The water buffalo is a species in the Bovidae family, which is mostly rare in Asia (98%), and is raised particularly for milk, meat, leather, and labor. Buffaloes are adaptable to diverse environmental conditions and can efficiently utilize inexpensive and low-quality fodder. Water buffalo breeding is most common in India (54%), Pakistan (20%), and China (13%) in the world. They are also breeding in Europe, especially in Italy, and are called Italian Buffaloes (FAO, 2022). The water buffaloes in Türkiye originate from the Mediterranean water buffaloes, which is a subgroup of the river buffaloes and are called Anatolian Buffaloes (Soysal et al., 2005).

Last fifty years, the world buffalo population has nearly doubled and increased more than 3 times in the EU. However, in the same period, a dramatic decrease has been observed in Türkiye. Thus, the share of the Anatolian water buffalo population in the world has seriously fallen (Türkyılmaz, 2010).

In Türkiye, water buffalo breeding is carried out for the production of milk (milk cream, yogurt, cheese, ice cream) and meat (sausage, salami, pastrami). However, the buffalo breeding enterprises are of the traditional family type, 83% of which are small-scale (1-5 heads) and the remaining 17% are medium-sized enterprises with an average of 8-10 buffaloes in Türkiye (Sarıözkan, 2011).

In Türkiye, livestock diseases, particularly parasitic originated, are encountered frequently. One of them is fasciolosis (=liver fluke), which is commonly caused by F. *hepatica* and/or F. *gigantica* worldwide (Soulsby, 1968). Previous studies have demonstrated that the disease causes remarkable economic losses (Abdel-Fatah et al., 2022; Arbabi et

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al., 2018; Kadir et al., 2012; Karshima et al., 2016; Wamae et al., 1998). The main production losses (PL) caused by fasciolosis in water buffaloes are summarized as; a reduction in carcass weight, milk yield losses, condemned liver, and extended calving intervals.

In the literature, there are many studies which estimated the losses due to fasciolosis in various species such as cattle, sheep, and goats (Abdel-Fatah et al., 2022; Arbabi et al., 2018; Arias-Pacheco et al., 2020; Hossain et al., 2011; Mehmood et al., 2017; Oljira et al., 2022). However, studies on water buffalos are rare (Abdel-Fatah et al., 2022; Tum et al., 2007). Due to the lower population and nervous temperament of the buffaloes, they have not been studied as much as cattle both in the world and in Türkiye. Therefore, there are limited studies on the presence of parasites/helminths in water buffaloes in Türkiye (Yılmaz et al., 2012).

The authors couldn't find any attempt about the production losses of fasciolosis in water buffaloes at the national scale in Türkiye. Therefore, this study is the first to estimate the annual (2024-year) production losses due to fasciolosis in water buffaloes in Türkiye.

MATERIALS AND METHODS

In the study, some technical and economic parameters used in the analysis were given in Table 1.

Table 1. Technical and economic parameters used in the analysis

Parameters	Value	References
Technical parameters		
-Total number of buffaloes	161,749	MAF, 2023
-Number of slaughtered buffaloes	69,597	MAF, 2023
-Number of milked buffaloes	79,333	MAF, 2019
-Reduction in weight gain (kg/year/head)*	5.2	Sarıözkan and Küçükoflaz, 2022
-Reduction in milk yield (kg/year/cow)*	44.3	Sarıözkan and Küçükoflaz, 2022
-Extended calving interval (day)	20	Sarıözkan and Küçükoflaz, 2022
-Weight of condemned liver (kg)	2	Sarıözkan and Küçükoflaz, 2022
-Mean prevalence (%)	6.9	Celep et al., 1990; Güzel and Kozan, 2013
*Financial parameters***		
-Price of meat (US$/kg)	9	ATB, 2024
-Price of milk (US$/kg)	1.0	DMYMB, 2024
-Cost of extended calving interval (US$/day)	4.5	Sarıözkan and Yalçın, 2009
-Price of whole liver (US$)	10	Calculated value

*2.5% in carcass weight and 5% in milk yield loss were considered due to disease. **34 TL=1 US$ in September 2024

Some official data and prices were used in the analysis and mean prevalence was calculated from previous limited published studies (Celep et al., 1990; Güzel and Kozan, 2013). Estimated loss analysis was performed for meat losses, milk losses, liver losses, and extended calving intervals (Since artificial insemination is not widely practiced in buffaloes in Türkiye, extra service cost could not be calculated). The calculation methods are given in detail in Table 2.

Table 2. Calculation method for estimating the total production losses due to fasciolosis in water buffaloes in Türkiye

Loss Items	Calculation Method
1. Meat losses	No. of slaughtered water buffaloes × prevalence of disease × reduction in carcass weight × price of meat
2. Milk losses	No. of milked water buffaloes × prevalence of disease × reduction in milk yield × price of milk
3. Liver losses	No. of slaughtered water buffaloes × prevalence of disease × price of liver
4. Extended calving interval	No. of slaughtered water buffaloes × prevalence of disease × extended day for calving interval × cost of extended calving
Total losses	(1+2+3+4)

Similar to Sariozkan and Yalcin (2009), a deterministic method was used to estimate annual losses. A spreadsheet model was designed in Microsoft Excel to estimate the annual loss (in 2024 current prices) caused by fasciolosis in water buffalo in Türkiye.

RESULTS

Estimated annual total production losses due to fasciolosis in water buffaloes in Türkiye are given in Table 3.

Table 3. Total production losses due to fasciolosis in water buffaloes in Türkiye

Loss Items	Quantity of Losses (US$)	%
1. Meat losses	69,597× 0.069 × 5.2 × 9 = 224,742	23.7
2. Milk losses	79,333 × 0.069 × 44.3 × 1 = 242,497	25.6
3. Liver losses	69,597 × 0.069 × 10 = 48,021	5.1
4. Extended calving interval	69,597 × 0.069 × 20 × 4.5 = 432,197	45.6
Total losses	947,457	100.0

The highest loss was estimated for the extended calving interval (US$ 492,658). Condemned liver losses due to disease got the lowest (4.8%) share in total losses. Milk losses and meat losses were 24.1% and 22.3% respectively (Table 3).

DISCUSSION

Fasciolosis is more common in Asian and African countries, and the disease is seen more in developing countries compared to developed countries in the world (Mehmood et al., 2017). Many studies have reported the prevalence of disease in water buffaloes in the world (Abdel-Fatah et al., 2022; Garg et al., 2009; Kadir et al., 2012; Yadav et al., 2015). Disease prevalence varies amongst different countries of the world. It has been reported to be 13.9% in India (Garg et al., 2009), 2.08% in Iraq (Kadir et al., 2012), 68.0% in Nepal (Yadav et al., 2015), 30.5% in Pakistan (Khan et al., 2009), 62.0% in Vietnam (Linh et al., 2003), 44.7% in China (Liu et al., 2009) and 4.2% in İran (Soosaraei et al., 2020).

The possible reasons for variations of disease prevalence in different countries and regions may be due to; environmental and climatic conditions, snail population, buffalo age, gender, diversity in management systems, and pasture pollution. The high prevalence is related to poor management practices and farmers' lack of information on its control.

Countries that have a higher prevalence may be a potential source of infection spread to other regions and a risk for possible future outbreaks. Hence, countries with a high prevalence need to pay attention to strategic points such as preventive medicine practices, and control of intermediate hosts and pastures.

The financial impact of the disease should not be ignored due to a decrease in production and profitability. Therefore, with this study, the total cost of fasciolosis was estimated in water buffaloes in Türkiye.

In Türkiye, previous reports showed that the total cost of the bovine fasciolosis for the Turkish economy could range between 29.5-43.3 million US$ annually (Sarıözkan and Yalcin, 2011). This equates the 1.1-1.7% of the reported total losses due to fasciolosis in the world (Zerna et al., 2021). The estimated cost of the disease for dairy cows varied between 23.1-34.1 million US$. The present study demonstrated that the cost of disease in water buffaloes (US$ 1,007,918) equates to 3-4% of the total losses of bovine fasciolosis in Türkiye.

There are few studies investigating the economic losses of disease in buffaloes worldwide. Additionally, in some of these studies, only losses attributed to condemned liver, live weight loss, and/or reduction in milk yield have been taken into account. For example, in India/Uttarakhand, Bardhan et al. (2014)

estimated the milk losses due to fasciolosis in buffaloes as 5.3 million US$. In Iran, losses of the condemned liver due to infected buffaloes were estimated between US$ 81,000-113,000 annually (Khaniki et al., 2013). Rehman et al. (2013) estimated the condemned liver losses per infected buffalo as US$ 1.1 in Pakistan. In this study, total annual losses were firstly estimated due to fasciolosis in water buffaloes in Türkiye. Moreover, this estimation may also allow the calculation of the worldwide losses in buffaloes.

CONCLUSION

In the future some measures might be implemented to reduce the financial impact of the disease;

- Farmers need to be informed about the quantity of losses and total cost of the disease,

- To prevent resistance, drugs should be used at the correct time and dose,

- Disease control and eradication expenditures must be increased,

- Pastures must be controlled and ameliorated.

- The buffaloes should be systematically dewormed and included helminth control programme.

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