Parasitism and farmers' practices in heifers under organic farming management

Faux A.-M.[1], Decruyenaere V.[2], Farinelle A.[3] and Stilmant D.[1]
[1]CRAW – Walloon Agricultural Research Centre, Agriculture and Natural Environment Department, 6800 Libramont, Belgium; [2] CRAW – Walloon Agricultural Research Centre, Production and Sectors Department, 5030 Gembloux, Belgium; [3]Fourrages Mieux asbl, 6600 Bastogne, Belgium

Abstract

Organic farmers are requested to allow cattle grazing as much as possible. However, this can lead to parasitism issues and thereby affect livestock performance. This study aimed to determine 'good practices' with respect to parasitism control in grazing heifers under organic farming conditions using a participatory approach. Six organic farms, including three dairy and three beef production systems, were monitored in 2015 and 2016. Recorded variables included the heifers' growth and parasitic pressure in terms of eggs abundance in faeces for three distinct parasites, grass availability, the nutritional value of grass and feed supplement, if any, and the farmer's practices regarding the grass and herd management. The relationship between recorded variables was investigated by principal component analysis (PCA). The PCA revealed a positive correlation between heifers' growth and the number of plots. However, heifers' growth and the number of plots were both negatively correlated with stocking rate, occurrence of anti-parasite treatment, and parasitic pressure. In conclusion, this study highlighted the importance of rotational grazing and low stocking rate for control of parasitic pressure and ensuring heifers' development.

Keywords: cattle, grazing, organic, parasitism, participatory research

Introduction

Parasitism is a major challenge to the health and development of grazing cattle. The challenge is even more important in organic agriculture because of its larger reliance on grazing and the restrictions on the use of anti-parasite treatments. However, controlled exposure to parasites helps to build immunity with a limited impact on livestock performance. A livestock production system that manages to control parasite populations is therefore sought. In this context, it has been shown that 'good practices' with respect to herd, grass and feed management can be effective in controlling parasitism (Remience *et al.*, 2013; Singh, 2014). Here, we investigated the relationship between parasitic pressure and farmers' practices in organic dairy and beef farms in order to identify practices to recommend to organic farmers.

Materials and methods

A survey was run on six organic farms, three dairy farms and three beef farms, in 2015 and 2016 (Table 1). All Farms were located in the south-eastern part of Belgium, at elevations ranging from 236 (Farm 1) to 591 (Farm 6) m a.s.l.. Temperature and rainfall were, on average, higher in 2015 than in 2016 during the grazing season (Pameseb, 2016). Lowest temperatures were found in Farm 3, and highest temperatures in Farms 4 and 5. Lowest rainfall was found in Farm 4, and highest rainfall in Farm 1. Loamy-stony soils with shale and/or sandstone load were found in Farms 2 to 6. In Farm 1, the soil was mainly loamy, slightly stony and included clay patches.

Heifers were weighed at the beginning, end, and when possible, the middle of the grazing season. Faeces were collected from five heifers per farm at each weighing time, and the parasitic pressure was noted on scale of 0 to 4 according to eggs abundance for three distinct parasites: *Fasciola hepatica* (FH), *Paramphistomum* sp. (PA), and *Ostertagia* sp. (OS). Also, the level of blood pepsinogen (mUTyr l^{-1}) was measured at the end of the grazing season to assess the acquired immunity against *Ostertagia* sp. The grass

Table 1. Characteristics of the six monitored farms: type of production, breed, altitude, and temperature and rainfall in 2015 and 2016

Farm ID	Type	Breed	Altitude	Temperature (°C)[1]		Rainfall (mm)[2]	
			(m a.s.l.)	2015	2016	2015	2016
1	Milk	Holstein (H), Montbeliarde (M), H×M	236	8.2-17	6.2-16.4	533	537
2	Milk	Holstein (H), Montbeliarde (M), H×M	454	7-17.3	6.7-16.9	472	436
3	Milk	Holstein (H), Jersey (J), H×J	569	7.2-16.9	5.2-16.4	423	480
4	Beef	Blonde d'Aquitaine	239	9.6-19.2	8.7-18.9	337	378
5	Beef	Salers	247	9-19.5	8-18.3	415	478
6	Beef	Mixed Belgian Blue	591	8-18.1	6.4-17.1	400	408

[1] Minimum and maximum average monthly temperature between April and October in 2015 and in 2016.

[2] Cumulative rainfall between April and October in 2015 and in 2016.

height and nutritional value were characterized. Recorded farmers' practices included the occurrence of anti-parasite treatment (noted as 0 or 1), the number of plots dedicated to heifers, the stocking rate (number of heifers per acreage), and the nutritional value of possible feed supplements. Nutritional values were estimated according to the VEM-DVE Dutch system (Tamminga *et al.*, 1994; Van Es, 1975).

The relationship between heifers' variables, parasitic pressure, grass variables, and farmers' practices was investigated by principal component analysis. Because the VEM and DVE contents were highly correlated with each other (r>0.92), VEM contents only were considered in the PCA.

Results and discussion

A total of 132 heifers was followed (35, 22, 20, 12, 22, and 21 in Farms 1 to 6). Among these, 86 (55-31), 82 (28-54), and 18 (2-16) were in their first, second and third grazing year in 2015-2016, respectively. Youngest grazing heifers were 4 to 6 weeks old (Farms 1 and 3 in 2015). Heifer's average daily gain (kg day^{-1}) ranged from 0.46 (Farm 1) to 0.66 (Farm 3) in dairy farms, and from 0.43 (Farm 4) to 0.52 (Farm 6) in beef farms.

Lowest parasitic pressure was found in Farms 2 and 3 (20% of heifers on which faeces were collected were positive to FH, PA, or OS in 2015; 0% in 2016), and highest pressure in Farms 1 (100% in both years) and 5 (60% in 2015; 100% in 2016). Heifers were treated in both years in Farms 1 and 6, in 2015 only in Farms 2 and 5, and in 2016 only in Farm 4. No treatment was provided in Farm 3. Rotational grazing was applied in Farms 2, 3 and 5, with 2 to 3 plots dedicated to heifers. The average stocking rate over both years ranged between 1.9 (Farm 3) and 4.3 (Farm 5) heifers ha^{-1} in all farms with the exception of Farm 4, where it was highest with 10.6 heifers ha^{-1}. Feed supplements were provided in Farm 1 [concentrates (cc), grass silage (gs) and hay] and Farm 3 (hay) in 2015 only, and in Farm 4 (cc and hay) and Farm 5 (cc and gs) in both years. A first PCA including all animals with parasitism data was achieved (90 data points, Figure 1). It showed a positive correlation between heifers' growth and the number of plots dedicated to heifers, as well as, to a lesser extent, the grass nutritional value (grassVEM). The heifers' growth and number of plots were both negatively correlated with the stocking rate and occurrence of anti-parasite treatment, as well as, to a lesser extent, with the parasitic pressure (FH and PA, in particular) and supplements' nutritional value (suppVEM). A second PCA including all animals with both parasitism and pepsinogen data was then conducted (57 data points, not shown). The blood pepsinogen level was positively correlated with heifers' growth, suggesting that heifers with relatively high pepsinogen level had acquired immunity, which would have resulted in a higher growth.

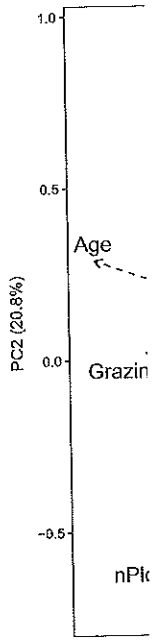

Figure 1. Dispersion of
corresponds to a given a

Among the moni
heifers' health ma
with Farmer 1 led
information on h

Conclusions

The present study
parasitism issues.
anti-parasite treat

References

Pameseb (2016) CRA
Remience V., Decruy
intestinal chez le
Singh A. (2014) Man
Canadian Organi
Tamminga S., Van Str
evaluation systen
Van Es A.J.H. (1975)

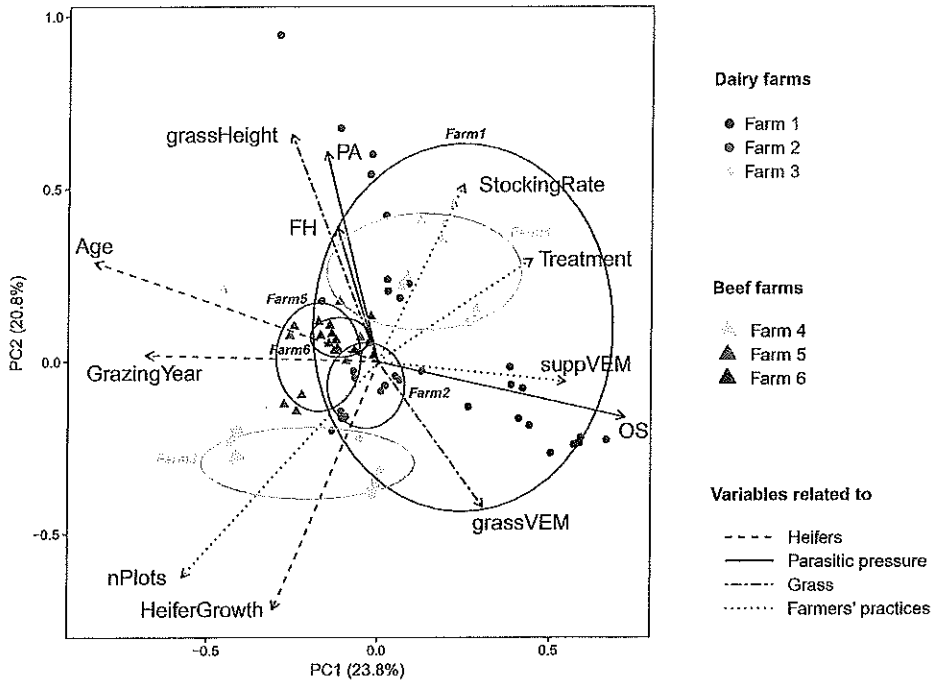

Figure 1. Dispersion of data points according to the first two components resulting from principal component analysis. Each data point corresponds to a given animal observed at a given time in a given farm. FH = *Fasciola hepatica*; PA = *Paramphistomum* sp.; OS = *Ostertagia* sp.

Among the monitored farms, Farm 3 offered an interesting example of recommendable practices for heifers' health management. In contrast, Farm 1 has experienced parasitism issues for a while. Discussion with Farmer 1 led to the decision to apply rotational grazing from 2017, which could provide interesting information on how to reverse high parasitic pressure to a controlled level.

Conclusions

The present study highlighted the importance of rotational grazing and low stocking rate to prevent parasitism issues. Both of these practices were associated with little or no need for feed supplement and anti-parasite treatment as well as with controlled parasitic pressure.

References

Pameseb (2016) CRA-W/Pameseb Network. Available at: http://www.pameseb.be.

Remience V., Decruyenaere V., Losson B., Vanvinckenroye C. and Wavreille J. (2013) Gestion raisonnée du parasitisme gastro-intestinal chez le jeune bétail laitier à l'herbe. *18ème Carrefour Productions Animales, CRA-W & GxABT.* pp. 59-65.

Singh A. (2014) Managing internal parasites in organic livestock. In: Telford L. and Macey A. (eds.) *Organic livestock handbook.* Canadian Organic Growers, Ottawa, Canada, pp. 46-56.

Tamminga S., Van Straalen W.M., Subnel A.P.J., Meijer R.G.M., Steg A., Wever C.J.G. and Block M.C. (1994) The Dutch protein evaluation system: the DVE/OEB-system. *Livestock Production Science* 40, 139-155.

Van Es A.J.H. (1975) Feed evaluation of dairy cows. *Livestock Production Science* 2, 95-107.