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Herbs in grassland and health of the dairy herd

Part 1: The potential medicinal value of pasture herbs

BO-12.10-002.01-005 "Antibiotic free" – sub-project "Herbs in grassland and health of dairy cattle"
Dutch Ministry of Economic affairs, Agriculture & Innovation

Abstract

In the period April - October 2011 Sibilla Laldi (MSc-student WUR) carried out the research project 'Herbs in grasslands and health of the dairy herd', a project of the Louis Bolk Institute. In this project the relation between pastures herbs and health of dairy cattle was studied on 22 dairy farms. An indicator was developed which combines the presence of individual herbs expressed as a percentage of pasture dry matter and the potential medicinal value of a herb.

The results indicate that pasture herbs do contribute to animal health. A relation was found between the new indicator and the use of antibiotics at farm level (expressed as Animal Daily Doses per year): the higher the share of herbs in the pasture dry matter, the lower the use of antibiotics. This finding offers perspective to grow or promote more herbs in pasture. Future research will focus on the effective contribution of specific herbs to the health of dairy cattle.

Diverse grasslands and health of dairy cows

Some farmers observe that their cows seem healthier when grazed on pastures rich in herbs. They suggest that there could be a link between a diverse diet, with more than just grasses, and the cows' better performance. The project *'herbs in grasslands and health of the dairy herd'* set out to investigate this observation applying a scientific method.

It is known that herbs play a role in maintaining the health of animals, and in many parts of the world herbs are used as the only medicinal treatment for sick animals. Herbs offer a new perspective in the strategy to achieve lower antibiotic use on farm, both to contrast antibiotic resistance and to reduce veterinary bills. Furthermore, growing herbs on grasslands could optimize the productivity of low-fertility areas, as herbs, in general, do not require high level of nutrients and thrive under sub-optimal soil conditions. There is a good reason to believe that herbs have a positive effect on health when they are present in the diet of cows in certain amounts, but little is known about how this works in practice.

Twenty-two enthusiastic dairy farmers from different parts of the Netherlands took part in this study. Measurements were carried out between April and October 2011 and included for example the grasslands' botanical composition, both in number of species and their meaning for cows' health, and the health of the cows themselves.



Which species are good for cows' health and "how many herbs are in my grassland?"

Not many studies have been conducted to identify the best botanical species to promote the health of dairy cows. There is however information based on traditional uses of herbs for cows, or for other ruminants like goats and sheep. Herbs are known to contain large amounts of minerals, vitamins or the so called *secondary metabolites* (like flavonoids, saponines, tannins, etc.), compounds that are directly involved in promoting health. Some herbs can be poisonous, but luckily they are very rare in Dutch pastures. Most of the grasses instead, even though they can have an important nutritional value, are not interesting in terms of medicinal properties.

To identify differences between pastures, in terms of herbs present, and their potential effect on the health of dairy cows the indicator "Medicinal Herb Enriched grassland" (MHE) was developed. First of all, the botanical composition of the grasslands was visually assessed using the "dry weight ranking" method. According to the estimated dry weight of species present in a sample quadrat of 50cmx50cm this method assigns a rank (1st, 2nd or 3rd). This method has proven to be very reliable and much less time consuming than methods relying on cutting and drying vegetation samples. In order to capture the presence of species over the year, two series of 100 samples were taken per farm, one in spring and one in late summer. On each participating farm the contribution of a species could thus be expressed as the average "dry weight percentage (DW%) of species X of the total dry weight".

The second step was to determine a weighting factor for the medicinal value of each species. Species which are known to have a potential beneficial effect on cows' health were assigned a +1, poisonous species a -1. All the other species, mostly grasses, non-interesting in terms of medicinal value, were given a 0.

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Finally, the DW% of each species was multiplied by its weighting factor, resulting in the MHE grasslands value. In theory the MHE value moves between -100 and +100. In Table 1 an example of how the MHE value of a participating farm is calculated is shown.

Table 1: Example of calculation of Medicinal Herb Enriched value of grasslands of participating farm

Common name	Latin name	Dry matter share%	Weighting	MHE value
Field meadow foxtail	*Alopecurus pratensis L.*	0.3	0	0.0
Daisy	*Bellis perennis L.*	0.2	1	0.2
Soft-brome	*Bromus hordeaceus L.*	0.0	0	0.0
Crested dogstail grass	*Cynosurus cristatus L.*	0.1	0	0.0
Common velvet grass	*Holcus lanatus L.*	4.3	0	0.0
Soft rush	*Juncus effusus L.*	0.5	1	0.5
Perennial ryegrass	*Lolium perenne L.*	29.0	0	0.0
Common timothy	*Phleum pratense L.*	8.5	0	0.0
Plantain	*Plantago major L.*	0.1	1	0.1
Annual meadow grass	*Poa annua L.*	9.2	0	0.0
Docks	*Rumex obtusifolium L.*	2.0	0	0.0
Common dandelion	*Taraxacum officinale Weber*	11.4	1	11.4
White clover	*Trifolium repens L.*	31.8	1	31.8
Total		100%		44.0

The average value of MHE of conventional farms was 20.2, with lowest value being 10.3 and the highest 34.8. Organic farms had an average MHE of 40.0, ranging from 21.3 and 62.4, and biodynamic farms had an average MHE of 33.4, with values comprised between 21.4 and 46.7. The results showed that the MHE of conventional and organic and conventional and biodynamic farms differed significantly. There was no significant difference between organic and biodynamic farms.

Indicators of cows' health

The most common diseases in dairy cows, for example mastitis, milk fever and lameness problems, are all multi-factorial. For this reason, it is difficult to measure cows' health with one single indicator. In this study the choice was made to perform a number of direct observations on the cows in the pasture and to assess the use of antibiotics at farm level.

Different observations on cows (Table 2) were used to assess the health status of the herd as a whole, to compare one farm to another and to see if there was a link between the health of cows and the average MHE of a farm.

In addition the Animal Daily Doses (ADD) per year was calculated based on the veterinary bills of individual farms. The ADD shows how many doses of antibiotic an average cow per farm is given on an annual basis. It was decided to evaluate ADD over a three year period (2008-2011). This evened out the differences in antibiotic use between years.

While the average of the group was of 2.1 doses of antibiotic per animal per year (well below the national average of 6.4 ADD measured in the year 2010), some farmers never used any antibiotics and the largest user of this group had an average of 7.7 doses per animal per year. The results showed that farming types did not differ statistically in antibiotic use, even though there were big differences from one farm to another.

Table 2: Summary of criteria used for herd health assessment based on direct observations

Category	Assessment level	Criteria	Reference	Range (re-scaled)
Behaviour	Herd	Isolation of individuals	Not natural state for cattle	0(not) / 2(yes)
	Individual	Alertness, curiosity, grazing activity	Healthy cow must be curious to noise and visual stimuli, eyes and ears must be active	
Nose / Eyes appearance	Individual	Nose dryness / dirtiness	Dry / dirty nose (transparent yellow / green discharge from nostrils) indicates sickness	0(not) / 2(yes)
		Eyes dirtiness	Dirty eyes (discharge wet / dry at least 3 cm) indicate sickness	
Coat appearance	Individual	Coat cleanliness: shine, smoothness, absence of blemishes	Dirty, rough coats indicate depressed, lethargic or acutely ill cows (e.g. diarrhoea), neglecting body care	0(clean) / 2(dirty)
Posture / Locomotion	Individual	Timing of steps, weight bearing balance	Bad posture or impaired walking indicates a lameness problem	0(not lame) / 2(lame)
Dung appearance	Individual	Thickness, feed residues	Dung should formed a pat 2-3 cm thick (not too liquid, not too stiff) with little undigested particles visible	0(good) / 2(bad)
Rumen	Individual	Rumination timing	Only healthy and unstressed cattle ruminate with a regular pattern of mastication (40-70 bites per minute)	0(>70) / 2(<40)
		Filling	Well filled rumen indicates health	0(good) / 2(bad)

Relation between herbs in grasslands and health of cows

A significant inverse correlation between the Medicinal Herb Enriched value of pastures and the average number of daily doses of antibiotics per animal per year was found. This means that, in this sample of farms, the higher the value of MHE calculated for the grasslands, the lower the amount of antibiotics used. Even though many factors contribute to create the environment for low or high antibiotic use, it was interesting to notice that pasture herbs and their potential medicinal value seemed clearly correlated with the antibiotic use. Figure 1 shows the two indicators MHE and ADD and the distribution of the individual farms.

Other significant correlations found were e.g.:

- amount of concentrates fed per cow (+) vs. secretions from nose and eyes (+)
- amount of concentrates fed per cow (+) vs. dirtiness of the cows' coats (+)
- amount of concentrates fed per cow (+) vs. milk yield (+)
- milk yield (+) vs. MHE (-)

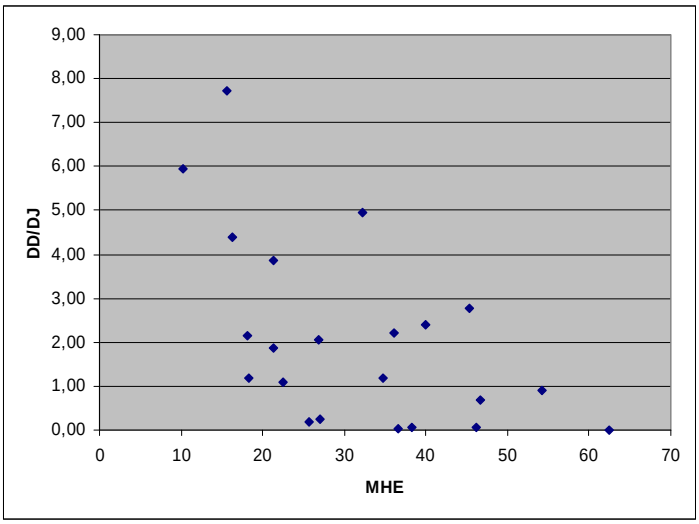

Figure 1 distribution of data on antibiotic usage (ADD) and potential medicinal value of grasslands (MHE)

What needs to be done now

This study confirmed what farmers had observed: dairy cows benefit from a varied diet that includes more than just grass, and in terms of health herbs are the ideal complement to support the different needs for minerals, vitamins and other important compounds.

However, to be able to understand the link between herbs and health more needs to be done. To understand which herbs contribute best to animal health and how much of a herb is required to have an effect, there is a need to trial feed cows with different herbs. Such a trial should combine measurements of the exact content of secondary metabolites of herbs and the health of cows by checking specific physiological parameters. It would also be interesting to see how the quality of milk changes with a diet rich in certain herbs, if milk is richer in vitamins and minerals for example.

This research was carried out in the project "Herbs in grassland and health of dairy cattle" of the Louis Bolk Institute by Sibilla Laldi (MSc student Wageningen University and Research) and supervised by Jan-Paul Wagenaar (LBI) and Egbert Lantinga (WUR)

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