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Will cows eat snow?

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It is difficult at times to maintain an uninterrupted supply of frost-free water to beef cows during winter. Most producers consider a disruption of the water supply to be a major problem. Others show little concern. In fact, some producers have chosen not to provide water to their wintering cattle and rely on consumption of snow for the animals to obtain their water needs.

A technique using isotopes was developed to measure consumption of water and/or snow by cattle wintering outside in free-ranging conditions and the present report contains measures of water and snow consumption by pregnant beef cows during the 1978-79 winter. The study was undertaken to answer the questions; if access to water is not provided will beef cows consume snow to obtain their water needs and, if they do consume snow, how much water equivalent is consumed relative to similar cows given once daily access to frost-free water? Preliminary observations were also made to determine the time required for cattle to start consuming snow after denial of water. It was not the intention of the authors to advocate or support the practice of relying on snow as a source of water for cattle, but to gain information and measurements of the possible beneficial or detrimental effects which could then be used to develop arguments for or against the practice.

Experimental

Preliminary observations - Two mature steers (approximate liveweight 800 kg) were offered a maintenance ration of brome grass hay and had free access to a frost-free water bowl. For the preliminary tests they were confined in a covered pen, access to water was denied, and weighed snow was offered in large containers. The steers were observed frequently, and behaviour and snow consumption noted. The steers showed behavioural disturbances during the first two days after access to water was denied. There was frequent bellowing and searching for water. Approximately 35 hours after denial of water the steers started eating snow from the containers. Both steers started consuming snow within a half hour of each other. During the next few days the steers readily and rapidly consumed snow and their distressed behavioural patterns subsided. After approximately one week of relying on snow the snow containers were removed and the steers were given access to water. Three days later access to water was again denied and the snow containers placed in the pen. On this occasion the steers showed no abnormal behaviour and quickly consumed snow. This cycle of access to water or snow was repeated on several more occasions and the steers quickly changed from snow to water and vice versa.

Snow consumption by pregnant beef cows - Eight beef cows aged three to five years were used. The cows were between their fifth and ninth month of pregnancy during the measurement period and were fed, under cover in a set of eight individual stalls, a ration of 4.5 kg of brome grass hay and 4.5 kg of alfalfa pellets. The ration was offered daily between 0830 and 1000 h. All the cows were accustomed to eating snow prior to the test period by placing them in a field without a water supply for seven days. The cows showed behavioural activities similar to those observed in the steers for approximately two days and then were observed to be licking and consuming snow. Later in the winter when the cows were switched from snow to water and vice versa they readily accepted the change.

The experiment was a Latin Square design with four treatments and two cows on each treatment during each of four 15-day periods. The treatments were:

1. Penned-water: Cows kept in a covered snow free area and allowed access to a weighed water supply for 15 minutes immediately after the daily feeding period.
2. Penned-snow: Cows kept individually in covered pens and allowed access to a large container of weighed snow except during the daily feeding period. In addition to the isotopic method, daily consumption of snow was determined by weight differences in the containers after adjustments were made for volatilization.
3. Field-water: Cows kept in a snow covered field but given access to a weighed water supply for 15 minutes immediately after the daily feeding period.
4. Field-snow: Cows kept in a snow covered field except during the daily feeding period.

Isotopically labelled water was administered to each cow and the rate of disappearance of the isotope from the total water pool was used to determine body water turnover. The daily water intake (equivalent to daily body water turnover) by each animal was partitioned into (1) free drinking water, (2) water from snow, and (3) water from food (preformed or metabolic). Estimates of water from food were derived from measurements of total water turnover minus measured water or snow intake of the cows kept in the covered pens.

Results and discussion

Except as noted above the cows showed no behavioural disturbances or apparent discomfort. All cows remained healthy, had normal rectal temperatures and calved normally in the spring. Average weekly air temperatures ranged between -8°C and -24°C except during the last two weeks when the average daily temperature rose to -4°C and 0°C, respectively. During the last week of the trial, air temperatures rose above freezing during the day time. The snow cover in the field was between 20 cm and 40 cm except during the last few days of the trial when there was rapid disappearance of snow and bare areas appeared in the field.

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Table 1. Water and snow intake by beef cows.

	Treatment			
	Penned-water	*Penned-snow*	*Field-water*	*Field-snow*
Av. liveweight (kg)	429	429	425	423
Feed intake				
Alfalfa pellets (kg)	4.50	4.50	4.50	4.50
Grass hay (kg)	4.13	4.12	4.18	4.18
Body water turnover (l/d)	26.5	23.2	29.2	26.7
Water from feed (l/d)	2.9	3.0	3.1	3.1
Free water intake (l/d)	23.6	*	19.4	*
Snow intake				
(water equivalent (l/d)	*	20.2	6.7	23.6

* Access denied.

Average liveweights, intake of pellets and hay, water turnover, and intakes of free water and snow are shown in Table 1. All the feed offered was consumed except by two cows which, irrespective of treatments, did not consume all the hay offered. Over all treatments the cows showed slight increases in liveweight with the cows, while penned, gaining more weight than when in the field. The average weight gain by cows when relying on snow was the same as when they received water. Most of the weight gain was presumably associated with development of the fetus and uterine growth.

Water turnover was greatest (29.2 l/d) in the 'field-water' cows and least (23.2 l/d) in the 'penned-snow' cows (Table 1). The 'penned-water' cows and the 'field-snow' cows had similar water turnovers, 26.5 and 26.7 litres per day, respectively. It is of interest to note that the field cows which were given access to water after each feeding period also consumed 6.7 litres (water equivalent) of snow per day. Since one field was used for the four field cows there may have been a tendency for the 'field-water' cows to consume snow along with the 'field-snow' cows by association. The cows were observed to consume snow through the day and it was also noted that when in the pen they consumed little during the night. The cows appeared to prefer snow in a powder form, sweeping it up with their tongues in a circular motion. Lumps of hard icy snow tended to be avoided.

Of importance is the energy cost of melting snow to water in the animal and raising the temperature of the water to body temperature. Daily consumption of 20 to 24 kg of snow initially at -10°C (an average value for the present experiment) would theoretically cost a cow between 615 and 740 kJ of energy or 15 to 20 % of their daily food intake, if extra heat had to be produced just to melt and warm the snow. However, feed intakes and liveweight gains while consuming water or snow were similar.

The present study showed that after an adaptation period cows will consume snow in amounts equivalent to that for once-a-day access to water. The studies on snow consumption by cattle will continue to further evaluate the potential costs to cattle and the precautions that should be exercised if this management practice is adopted.

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Thermal responses in sheep to the ingestion of cold high moisture feeds

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During winter, livestock that are not housed are exposed to cold temperatures. Not only are they subjected to environmental temperatures many degrees below their body temperature, but they can also be cooled by the feed and water that they consume at low temperatures. This feed and water has to ultimately be heated to body temperature.

On normal dry rations the moisture intake from feed is not great, and the amount of water drunk by an animal tends to fall as the environmental temperature drops. Consequently, the amount of energy required to heat the ingested food and water is seldom great in relation to the total heat produced by the animal. However there are special cases where large volumes of cold or frozen water are ingested involuntarily as a component of the feed. This situation occurs with high moisture rations such as silage and special crops like turnips and fall or winter grazed cereals. In these situations water intake could be up to six-times greater than what would be freely drunk. If these feeds are consumed at low temperatures or in a frozen state they could represent a substantial cooling of the animal.

While many of the direct effects of cold temperature on domestic livestock have been studied, it is not known whether a high involuntary intake of cold moisture has important short and/or long term effects on animal performance by influencing body and

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