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XII-1 (1953)

INFLUENCE OF AGE OF MEADOW HAY IN BEEF COWS' WINTER RATIONS FOLLOWING SUMMER GRAZING ON SAGEBRUSH-BUNCHGRASS RANGE

by
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Range beef cattle that spend four months or longer on green grass are generally considered to be free from danger of vitamin A deficiency if a normal amount of carotene is available during the dry feed season. Eastern Oregon cattle, depending on sagebrush-bunchgrass range for summer feed, spend approximately three months on actively growing green grass. The main forage producing grasses, bluebunch wheatgrass (Agropyron spicatum) and Idaho fescue (Festuca idahoensis), normally mature during July. Such a range is adapted to spring and early summer grazing but a lack of high elevation forage in much of the area results in its use as summer range. The effects of late summer low quality forage are made more serious, in many cases, by a deficiency of total feed available.

Following summer grazing many herds graze on dry meadow aftermath before receiving meadow hay for the remainder of the winter feeding period.

Carotene or vitamin A storage of breeding herds managed as described could be low enough to make the winter level of carotene intake more important that where longer periods are spent on green grass.

This study was developed to determine if age of meadow hay was related to changes in nutritive value that would influence production of beef cows. Carotene content of the hays was of special interest.

Information is also needed on how winter feeding of old stacked hay should be managed since it is a common practice to carry hay from one year to the next as insurance against severe winters or short hay crops.

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[1]Jointly operated by the Oregon Agricultural Experiment Station, Oregon State College, and the Bureau of Land Management, U. S. Department of Interior.

MATERIAL AND PROCEDURE

Eighteen pregnant four and five-year old Hereford cows were selected for the winter feeding period of 1950-51. Thirteen of the same cows were used during the winter of 1951-52. Five were replaced because of late conception and in one case, failure to conceive.

All cows grazed together on sagebrush-bunchgrass range from late May until during September. They were then moved to the valley to graze on meadow aftermath and some bunched hay until winter feeding was started in late November or early December.

Meadow hay used in this study was from meadows of the wet land type with over 80 percent of the forage consisting of rush (Juncus spp.), and sedge (Carex spp.). Mixed grasses and forbs complete the forage composition. Crude protein content averaged approximately 7 percent. Alfalfa hay used was badly bleached (Table 1).

Cows were individually fed in an open shed each morning. Water, salt and bonemeal were available while the animals were in an open pen during the rest of the 24-hour period.

Nine cows were fed meadow hay from the 1949 crop each winter. The remaining animals were fed hay harvested during the preceding summer. Three cows from each age of hay were randomly assigned to one of the following rations: Full-feed of meadow hay, full-feed of meadow hay plus three pounds of barley, and a full-feed of meadow hay plus three pounds of alfalfa.

Blood samples were collected from cows and calves by venous puncture. The citrated blood was immediately put under refrigeration and was analyzed within two days. Plasma carotene and vitamin A analyses were made by the method of Kimble (1939).

RESULTS AND DISCUSSION

Hay Consumption

Holding hay in the stack for one or two years did not influence palatability enough to cause a difference in rate of consumption when compared with new hay.

Consumption of hay decreased by a significant[2] amount during the last half of the second winter (Table 2). The trend of decreased

[2]Significant refers to differences found to be statistically significant at the 5 percent level of probability.

consumption was associated with warmer temperatures and possibly a loss of appetite for the dry ration over the long feeding period. A temporary drop in feed intake found at parturition would also account for a part of the late winter drop.

Carotene Intake

The calculated average daily carotene intake of all cows was well above the level considered to be minimum for normal reproduction (Table 3).

The one and two year old hays were found to provide an average of 19 milligrams less carotene (highly significant[3]) per 100 pounds of cow weight per day than did the new hay.

An average drop of 9 milligrams of carotene (highly significant) per 100 pounds of cow weight was found to be associated with the lower hay consumption during late winter.

The carotene supplied by the addition of three pounds of bleached, sun-cured alfalfa resulted in a significant increase of 2.5 milligrams of carotene per 100 pounds of cow weight over meadow hay alone.

The average daily carotene intake during the winter of 1951-52 was found to be 4 milligrams per 100 pounds body weight less (highly significant) than during the previous winter. The slightly lower carotene content of the 1949 hay fed and the greater drop in late winter hay consumption are factors contributing to the lowered intake during the second winter.

Blood Plasma Carotene of Cows

The average blood plasma carotene values of cows on both "old" and "new" hay were greater (highly significant) during the second winter (Table 4). This was true, although the average carotene intake per 100 pounds of body weight was found to be 4 milligrams less than during 1950-51. The reason, or reasons, for the higher plasma carotene values on a lower carotene intake are unknown. The main known difference between the two winter seasons was that the second winter was more severe (Table 5). The physiological effect of the colder winter was amplified by the fact that the animals spent most of the 24-hour period without protection from the weather. The frequency and amount of snowfall prevented the animals from receiving much benefit from a limited amount of sawdust provided for bedding.

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[3]Highly significant refers to differences found to be statistically significant at the 1 percent level of probability.

A possible explanation for the higher blood carotene levels is the increased thyroid activity associated with cold temperatures. Evidence has been presented by Chanda et al. (1951) that administration of thyroxine to cows will increase apparent digestibility of carotene. However, Stallcup and Herman (1950) found no consistent trend in blood plasma carotene that could be associated with decreasing ambient temperature to 4° F.

The "new hay" fed each winter was found to result in highly significant increases of 0.49 parts per million during 1950-51 and 1.69 parts per million of plasma carotene during 1951-52 when compared with feeding old hay.

Late April blood plasma carotene levels were found to average 0.36 parts per million less than were found during early winter. A portion of the lower plasma carotene content can be attributed to the decrease shown by Sutton et al. (1945) to be related to parturition and beginning lactation. The lower hay intake during late winter would also be expected to depress the plasma carotene level.

1952 Calf Blood Values

The average blood plasma carotene and vitamin A values found for the 1952 calves varying in age from one day to 46 days were in a low range (Table 6). No comparative values are available for the 1951 calves.

The blood plasma carotene of calves over 34 days of age was found to average 0.10 parts per million higher (significant) than the plasma carotene of younger calves.

The blood plasma carotene and vitamin A values of the calves' dams on the same date were in a range generally not considered to be too low to support normal reproduction or early calf growth.

Calf Response

No important differences due to age of hay fed were found in calf birth weights, gains from birth to 28 days of age, or gains from birth to weaning.

Following the severe winter of 1951-52 birth weights and subsequent gains were much lower than is normally expected. This was true although the cows appeared to carry approximately the normal amount of condition at the end of the winter feeding period.

No symptoms of vitamin A deficiency in cows or calves were noted during 1950-51. The cows were also free of symptoms of vitamin A deficiency during 1951-52.

During the spring of 1952 several calves were abnormally weak at birth. Symptoms suggestive of vitamin A deficiency were noted in calves from cows on both 1949 and 1951 hay. Symptoms noted alone or in combination were: Exopthalmos, excessive lacrimation, incoordination and edematous swelling of knees and hocks. Six calves also suffered from scours for over 7 days during the first month. The symptoms were less apparent by late April prior to the time the cattle went to summer range. The severe weather ended in late March.

SUMMARY

No significant differences in consumption of new, one, or two year old wet land meadow hays were found when fed to 18 pregnant Hereford cows during two winter feeding periods.

When compared with feeding new meadow hay the one and two-year-old hays were found to result in an average reduction of 19 milligrams of carotene intake per 100 pounds of cow weight.

The average blood plasma carotene values of the Hereford cows was found to be greater during the severe winter of 1951-52 than was found on a higher carotene intake during the relatively mild winter of 1950-51.

Increases in plasma carotene of 0.49 parts per million and 1.69 parts per million due to the new hays fed were found in the cows' bloods during 1950-51 and 1951-52 respectively.

No important differences due to age of meadow hay fed were found in calf birth weights, gains from birth to 28 days of age, or gains from birth to weaning. However, the severe winter of 1951-52 was found to seriously reduce calf response.

Analyses of 1952 calf bloods, before going to summer range, showed carotene and vitamin A values to be in a marginal range.

No symptoms of vitamin A deficiency were noted in the cows at any time. The calves were also free of vitamin A deficiency symptoms during the spring of 1951. Following the severe winter of 1951-52 some calves from cows on both 1949 and 1951 meadow hay showed symptoms suggestive of vitamin A deficiency. Symptoms noted alone or in combination were: Exopthalmos, excessive lacrimation, incoordination, edematous swelling of knees and hocks, weakness at birth, and scours.

It is suggested that old meadow hay should be fed as early in the winter feeding period as possible. Further investigation of an apparent relationship of severe winter weather to carotene and vitamin A metabolism of beef cows and their calves is needed.

LITERATURE CITED

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Table 1. Average carotene values of hay when fed

Year fed	Year Hay Was Harvested				
	1949	1950		1951	
	M. hay	M. hay	Alfalfa	M. hay	Alfalfa
	(p.p.m.)	(p.p.m.)	(p.p.m.)	(p.p.m.)	(p.p.m.)
1950-51	22.5	43.7	32.0		
1951-52	20.5			47.0	21.0

Table 2. Average air-dry hay consumption of cows during winters of 1950-51 and 1951-52

Hay fed	Winter Hay Was Fed			
	1950-51		1951-52	
	Early	Late	Early	Late
	(lbs./day)	(lbs./day)	(lbs./day)	(lbs./day)
"Old hay"	22.4	20.3	23.8	16.1
"New hay"	21.4	18.3	18.9	13.8

Table 3. Summary of average calculated daily carotene consumption per 100 pounds of cow weight during the winters of 1950-51 and 1951-52.

Year fed	Year Hay Was Harvested		
	1949	1950	1951
	(Mgm)	(Mgm)	(Mgm)
1950-51	24.3	43.5	
1951-52	20.3		39.6

Table 4. Summary of plasma carotene values of cows for 1950-51 and 1951-52

Hay fed	Date Bled			
	1951		1952	
	1/1	4/26	2/6	4/30
	(p.p.m.)	(p.p.m.)	(p.p.m.)	(p.p.m.)
"Old hay"	0.98	0.64	1.56	1.56
"New hay"	1.54	1.04	3.54	2.95

Table 5. Summary of average minimum temperature, number of days with minimum temperature below 10° F, and number of days with snow covering the ground during winters of 1950-51 and 1951-52

Portion of Winter	1950-51			1951-52		
	Avg. min. temp.	Below 10°F	Snow cover	Avg. min. temp.	Below 10°F	Snow cover
	(°F)	(days)	(days)	(°F)	(days)	(days)
First 54 days	18	10	30	9	24	54
Last 69 days	23	3	21	20	19	35
Total		13	51		43	89

Table 6. Summary of April 30, 1952 plasma carotene and vitamin A values of 16 calves ranging in age from 1 to 46 days

Hay fed	Calf Age			
	Under 34 days		Over 34 days	
	Carotene	Vitamin A	Carotene	Vitamin A
	(p.p.m.)	(p.p.m.)	(p.p.m.)	(p.p.m.)
"Old hay"	0.14	0.17	0.22	0.14
"New hay"	0.19	0.19	0.32	0.16