

EFFECT OF THE STAGE OF CUTTING BERSEEM ON THE YIELD, CHEMICAL COMPOSITION AND NUTRITIVE VALUE OF ITS HAY

By

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SUMMARY

This work was carried out to study the nutritive value of berseem hay using the ground curing method at the different successive cuts. Hay under investigation was made from Miskawi berseem in two experimental years (1959—61). Berseem was cut at average heights of 30—35 cm. and 60—70 cm. Early cutting of berseem increased the number of cuts by one more than late cutting. Nine digestibility trials were conducted in the first experimental year to determine the nutritive value of the hay. The following results were obtained :

(1) The average total yield of hay per feddan on dry matter basis was 1562.4 kg. for early cut and 1330.7 kg. for late cut berseem. Early cutting increased the yield by 17.41% more than late cutting.

(2) Crude protein decreased with the successive cuts, while crude fibre increased. Ether extract, N.F.E. and ash, fluctuated during the successive cuts without any special trend.

(3) The digestibility of the different nutrients of hay varied within narrow limits among successive cuts. The starch values of hay from berseem cut at 30—35 cm. were 30.37, 34.42, 32.51, 34.51, and 28.76 kg in the first through the fifth cuts, respectively. The corresponding figures for that cut at 60—70 cm. were 32.53, 30.09, 31.67 and 25.90 kg, in four cuts, respectively. The digestibility and nutritive value of early cut berseem hay were higher than those of late cut berseem hay.

(4) The yields of the various nutrients (both crude and digested) of early cut berseem hay were relatively higher than those of late cut berseem hay. The starch value showed the same trend, being higher with the early cut berseem hay by 14.61%.

(5) The mineral content (P, Ca and Mg) of early cut berseem hay was relatively higher than that of late cut berseem hay.

INTRODUCTION AND REVIEW OF LITERATURE

In the U.A.R. there is unequal distribution around the year of nutrients available for livestock. In winter berseem provides ca. 3.82 million tons of starch value while in summer the whole feeding-stuffs supply is ca. 1.61 tons of S.V. The shortage of food in summer could be minimized by preserving the surplus from berseem as hay or silage.

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Hay is the most important form of harvested forage, because it is associated with a high keeping quality and it is easily prepared by sun drying on the ground. Kellner, (1926), Wiegner, (1926), Nordenborg, (1928), Landis, (1932) and Edin et al. (1933) concluded that ground-drying of clover was the best method for haymaking in favorable weather.

Other methods have been adopted for haymaking, including improvements to reduce mechanical losses and to speed the rate of drying. Artificial drying with the aid of heat is one of the most efficient processes of haymaking. Although losses are reduced to minimum, yet the costs of the drying equipment cannot be afforded by the ordinary farmer.

Ghoneim et al, (1949) found that the starch equivalent of artificially dried clover hay in Egypt was about 1.2 times that of field-cured hay. From the economical point of view, cost of artificially dried hay must not exceed 1.2 times that of field cured hay. These results differed from those recorded by Hodgson et al, (1948), and Min. of Agric. (1961), who found that the starch value of artificially dried berseem and field cured hay were 32.5 and 33.2 kg., respectively.

Ghoneim et al, (1951) studied drying of berseem for haymaking in bundles and not bundled under a shed and in the sun. They found that unbundled berseem under a shed gave the best results with the least dry matter loss.

Laila, (1962) used the tripod or pyramid method for haymaking. She obtained better results, having less losses of dry matter with this method than with drying on the ground.

The present work was conducted to study the nutritive value of berseem hay with two systems of cutting in different successive cuts.

EXPERIMENTAL AND METHODS

This work was conducted at the Experimental Station of Animal Nutrition, Faculty of Agriculture, Giza (U.A.R.). Eighteen feddans over two successive years (1959-1961) were cultivated with Miskawi berseem as the source of experimental material. The area was divided into two sectors. In the first sector cutting was performed when the average height of plants was 30-35 cm., while it was 60-70 cm. in the second sector. Five cuts were obtained by early cutting berseem, one more than late cutting.

The berseem was spread on the ground in a thin layer of 20-30 cm. and was hand turned every morning. When the moisture content reached about 16% or less, the hay was piled and kept for feeding.

Nine digestibility trials were performed with two full grown rams to determine the nutritive value of hay obtained during the first experimental year.

Preliminary periods and collection periods of 10 days each were used. Hay needed for the digestibility trail was chopped, weighed and kept in cotton bags. A small portion was taken for chemical analysis. A composite sample of faeces was prepared from the daily samples taken after drying at 105°C for twenty-four hours. Chemical analyses followed the methods used by Ghoneim et al, (1963).

RESULTS AND DISCUSSION

1.—The yield of hay.

Table (I) shows the yield of dry matter of hay per feddan during the two experimental years. The yield of hay per feddan increased in the successive cuts except in the last cut which had the lowest yield. The yield of hay obtained from berseem cut at 30-35 cm. was more than that obtained from berseem cut at 60-70 cm. This increase was 5.30 and 25.08% in the first and second experimental years, respectively, the average being 17.41%.

TABLE I.—Yield of Dry Matter of Hay per Feddan

The cuts	Early Cutting		Late Cutting	
	1st. year	2nd. year	1st. year	2nd. year
	Kg.	Kg.	Kg.	Kg.
1st cut	137.8	286.1	170.7	413.7
2nd cut	172.2	464.7	326.4	455.7
3rd cut	273.4	507.9	388.9	602.3
4th cut	371.0	507.9	145.0	158.6
5th cut	131.2	249.5	—	—
Total	1085.6	2016.1	1031.0	1630.3

2.—Chemical Composition

On moisture free basis, the crude protein content decreased in the successive cuts while the crude fibre increased. The crude protein content of early cuts of berseem hay appeared to be higher than those of late cuts. Ether extract and ash contents fluctuated among the various cuts without any special trend.

The average percentages of the different nutrients in the two experimental years are summarized in Table (2).

3.—Digestible Nutrients

The data show that there were no obvious differences between the digestion coefficients of the different nutrients with the successive cuts. It was thus possible to give a mean value for the digestion coefficients of the various nutrients of hay as shown in Table (3). It can be seen that there was a slight increase in the digestibility of early cut berseem hay compared to late cut berseem hay.

TABLE 2.—Average Composition of Berseem Hay at Two Stages of Cutting over the Two Years.

The cuts	Dry matter	Composition of dry matter				
		Crude protein	Ether extract	Crude fibre	N.F.E.	Ash
<i>Early cut</i>						
1st cut	89.73	21.35	2.81	22.30	35.72	17.82
2nd cut	89.64	23.39	4.29	21.47	34.09	16.75
3rd cut	88.07	22.79	3.56	24.14	32.77	17.74
4th cut	89.29	19.51	3.08	25.74	38.47	18.70
5th cut	89.08	13.24	3.76	30.06	37.07	15.87
<i>Late Cut</i>						
1st cut	89.68	19.60	2.87	23.72	38.12	15.69
2nd cut	89.96	19.14	2.76	22.17	35.24	15.70
3rd cut	89.53	17.06	4.31	29.17	37.16	12.25
4th cut	89.71	12.04	4.02	33.18	38.77	11.99

TABLE 3.—Digestibility of Berseem Hay

The nutrients	Early cut	Late cut
	%	%
Dry matter	57.93	51.81
Organic matter	57.52	55.36
Crude protein	66.50	58.16
Ether extract	68.74	66.03
Crude fibre	43.89	42.19
N.F.E.	60.21	62.36

The digestible nutrients of hay on moisture free basis at successive cuts with the two systems of cutting are shown in Table (4). The digestible nutrients of hay at the two stages of cutting followed the same trend as the chemical composition.

TABLE 4.—Digestible Nutrients of Berseem Hay.

The cuts	Digested dry matter	Digested nutrients of matter			
		Crude Protein	Ether extract	Crude fibre	N.F.E.
	%	%	%	%	%
<i>Early cut</i>					
1st cut	53.49	15.13	1.85	8.93	20.27
2nd cut	46.71	17.57	3.31	8.82	18.16
3rd cut	54.36	18.44	3.22	10.26	18.23
4th cut	48.10	14.38	1.96	9.32	26.82
5th cut	49.71	7.62	2.29	12.64	24.86
<i>Late cut</i>					
1st cut	44.03	11.30	1.32	0.90	26.91
2nd cut	46.89	10.50	1.88	10.43	24.72
3rd cut	46.03	10.12	3.71	11.93	23.01
4th cut	44.53	5.61	2.71	14.46	24.67

4.—Nutritive Value

The results concerning the nutritive value of hay during the successive cuts with the two systems of cutting are shown in Table (5). It can be concluded that the nutritive value of early cut berseem hay was, in general, slightly higher than that of late cut berseem hay.

TABLE 5.—The Nutritive Value of Berseem Hay

The cuts	Early cut			Late cut		
	Starch value	Nutritive ratio	Value (1) number	Starch value	Nutritive ratio	Value (1) number
1st cut	30.37	2.26	74.13	32.53	3.55	74.00
2nd cut	34.42	2.06	78.07	30.09	3.79	69.35
3rd cut	32.51	1.93	74.29	31.67	4.35	70.11
4th cut	34.51	2.89	74.14	25.90	8.22	59.36
5th cut	28.76	5.66	67.16	—	—	—

$$(1) \text{ Value number} = \frac{\text{True starch value}}{\text{Calculated starch value}} \times 100$$

5.—The Yield of Nutrients

The yield of both crude and digested nutrients and starch value of early cut berseem hay was relatively higher than those of the late cut. This increase was parallel to the increase in the yield of the green berseem. Early cutting of berseem increased the total yield of starch value and digestible protein per feddan by 14.61 % and 61.92 %, respectively, more than late cutting.

6.—Mineral Contents

The average mineral content (P, Ca and Mg) of hay at the different successive cuts is shown in Table (6).

TABLE 6.—P, Ca and Mg Contents of Berseem Hay

The cuts	Early cut			Late cut		
	P	Ca	Mg	P	Ca	Mg
	Mg/100g dry matter					
1st cut	430	1562	326	373	1762	220
2nd cut	369	1494	300	380	2039	221
3rd cut	397	1625	256	309	1502	371
4th cut	361	1853	291	329	1493	177
5th cut	305	1736	337	—	—	—

The P content of hay followed that of crude protein, decreasing with the successive cuts.

The Ca and Mg contents of hay fluctuated without any special trend among the successive cuts. The ranges of these elements in the various cuts expressed as mg/100g D.M. were 289-454, 1,423-2,069 and 237-415 for P, Ca and Mg, respectively, in early cut berseem hay. The corresponding figures for late cut berseem hay were 264-400, 1,337-2,075 and 146-891.

Early cutting of berseem increased the P, Ca and Mg contents of the hay by 14.93, 0.54 and 22.90 %, respectively, more than late cutting in the first experimental year. In the second experimental the increases were 37.86, 25.36 and 31.10 %.

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القيمة الغذائية للدريس

الملخص

تمت دراسة القيمة الغذائية للدريس المجفف بالطريقة الأرضية لتقدير الفقد في المركبات الغذائية المختلفة ومعادل النشا في الحشوات المتتابعة - ولقد حصل على الدريس من تجفيف البرسيم المسقاوى موضوع الدراسة في تجارب الحش خلال عامين (١٩٥٩ - ١٩٦١) وتم حش البرسيم على ارتفاع منخفض ٣٠ - ٣٥ سم وآخر مرتفع ٦٠ - ٧٠ سم .

لقد كان محصول الفدان من الدريس ١٥٦٢ر٤ كجم ، ١٣٣٠ر٧ كجم مادة جافة في حالة حش البرسيم مبكرا (٣٠ - ٣٥ سم) ومتأخرا (٦٠ - ٧٠ سم) على التوالي بزيادة قدرها ١٧ر٤١٪ في حالة الحش المبكر عنه في حالة الحش المتأخر .

وأظهر التحليل الكيماوى للمادة الجافة في الدريس انخفاض البروتين الخام وارتفاع الألياف الخام في الحشوات المتتابعة . أما بالنسبة لمستخلص الأثير والكربوهيدرات الذائبة والرماد فكانت نسبتها متذبذبة في الحشوات المتتالية بدون اتجاه معين .

بالنسبة لمعاملات الهضم للمركبات الغذائية المختلفة في الدريس فلقد اختلفت في حدود ضئيلة في الحشوات المتتابعة وكان متوسط معاملات الهضم لدريس البرسيم المحشوش مبكرا أكبر نسبيا من مثيلاتها لدريس البرسيم المحشوش متأخرا .

ولقد تذبذب معادل النشا للدريس في حشوات البرسيم المتتالية حيث كان أقلها في الحشة الأخيرة . وقد كان معادل النشا لدريس البرسيم المحشوش مبكرا بالنسبة للخمس حشوات هي ٣٠ر٣٧ ، ٣٤ر٤٢ ، ٣٢ر٥١ ، ٣٤ر٥١ ، ٢٨ر٧٦ كجم على التوالي أما بالنسبة لدريس البرسيم المحشوش متأخرا فكان معادل النشا للأربع حشوات هي ٣٢ر٥٣ ، ٣٠ر٠٩ ، ٣١ر٦٧ ، ٢٥ر٩٠ كجم على التوالي .

ولقد تبين أن القيمة النشوية لدريس البرسيم المحشوش مبكرا أكبر نسبيا منها في دريس البرسيم المحشوش متأخرا .

ولقد انخفضت محتويات الدريس من الفوسفور بتتابع الحشوات متخذة بذلك نفس اتجاه البروتين الخام وكانت محتويات الدريس من الفوسفور في حالة

حش البرسيم مبكرا أكبر منها في حالة حش البرسيم متأخرا . ولقد تراوحت محتويات درس البرسيم المحشوش مبكرا من ٣٠.٥ الى ٤٣.٠ ملليجرام/١٠٠ كجم مادة جافة أما دريس البرسيم المحشوش متأخرا فتراوحت كمية الفوسفور ما بين ٢٧٩ الى ٣٨٠ ملليجرام/١٠٠ جم مادة جافة .

أما بالنسبة لمحتويات الكالسيوم والمغنيسيوم في الحشات المختلفة فلم تتبع اتجاه معين وتراوحت كمية الكالسيوم والمغنيسيوم لدرس البرسيم المحشوش مبكرا ما بين ١٣٩٥ - ٢٠٠٨ ، ١٤٦ ، ٤١٥ - ١٠٠ ملليجرام/١٠٠ جم مادة جافة على التوالي . أما مثيلاتها لدريس البرسيم المحشوش متأخرا فكانت ١٣٣٧ - ٢٠٧٥ ، ١٧٨ ، ٣٥٨ ملليجرام/١٠٠ جم مادة جافة للكالسيوم والمغنيسيوم على التوالي .

ولقد كان محصول المركبات الخام والمهضومة ومحتويات المادة المدنية وكذلك معادل النشا لدرس البرسيم المحشوش مبكرا أكبر نسبيا منها بالنسبة للبرسيم المتأخر الحش . وكانت القيمة الغذائية للدريس المتحصل عليه من فدان برسيم حش مبكرا أعلى بمقدار ١٤٦١٪ عن دريس حصل عليه من فدان برسيم حش متأخرا .