

Effect of Time of Day on the Water Soluble Carbohydrate Content of Kikuyu Grass

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1. Introduction

In studies with temperate forage species water soluble carbohydrate (WSC) content has been observed to increase during the day due to photosynthetic activity within the plant. With warm and sunny conditions the content of WSC in the plant is higher in the afternoon than early morning. It has been suggested that cutting of forages for silage should be delayed until the afternoon to maximise the amount of WSC available for fermentation. There are few data available on variation in WSC content of tropical grasses, so the current study was conducted to monitor changes during the day in the composition of kikuyu grass (*Pennisetum clandestinum*).

Table 1. Effect of time of day on the composition of kikuyu grass in study 1

Sampling time (Australian Eastern Standard Time)	DM content (g/kg)	N content (g/kg DM)	Water-soluble carbohydrate (g/kg DM)	Starch (g/kg DM)	OMD
March - 30 day regrowth					
7.35 h	167	34.6	50.2	42.3	0.698
11.45 h	167	34.9	68.4	51.4	0.710
15.55 h	171	33.6	66.1	57.8	0.726
Time of day	ns	P<0.10	P<0.01	P<0.01	P<0.01
s.e.d.	5.5	1.07	2.66	4.17	0.0073
April - 30 day regrowth					
8.20 h	191	24.4	48.1	40.4	0.668
14.00 h	203	23.6	60.2	50.6	0.674
17.00 h	202	23.2	63.2	53.3	0.673
April - 45 day regrowth					
8.20 h	193	24.4	48.0	39.0	0.672
14.00 h	196	23.6	61.0	52.0	0.681
17.00 h	202	22.9	63.8	51.7	0.674
Regrowth	ns	ns	ns	ns	ns
Time of day	P<0.01	P<0.01	P<0.01	P<0.01	ns
Regrowth × time	P<0.10	ns	ns	ns	ns

2. Materials and Methods

Two studies were conducted in which nitrogen (N) fertilised kikuyu grass was sampled to monitor changes in WSC during the day. The first study was conducted over 3 days in March with 30 day kikuyu regrowth and in adjoining plots over 3 days in April with 30 and 45 day kikuyu regrowths. A second study in April investigated the change in WSC content of 30 and 45 day regrowth kikuyu mown for silage production at three times during one day. The two studies were conducted at different sites within

the same paddock. The forage samples were analysed for DM, N, WSC, and starch content, and for *in vitro* organic matter digestibility.

3. Results and Discussion

In the first study weather conditions over the three days during the March sampling ranged from warm and sunny through to overcast. Warm and sunny weather was experienced on all days during the April sampling. No significant differences were observed between days in forage composition at either sampling. Composition of the kikuyu grass from this study is presented in Table 1.

During the second study warm and sunny weather conditions prevailed until just prior to the last mowing. Rainfall from local storms commenced during mowing and continued to fall during the collection of samples. This resulted in a decline in DM content but no differences in the composition of the DM. Composition of the kikuyu grass from this study is presented in Table 2.

The results from this study confirms that sugar levels are higher in kikuyu grass in the middle of the day and in the afternoon (60.6 g/kg DM), than in the morning (47.2 g/kg DM). Despite this increase in sugar content (to 12.0 g/kg fresh forage) the level was still well below the critical value (25-30 g/kg fresh forage) for low risk preservation of unwilted forage (Wilkinson, 1990). Other effects of changing the time of cut to the afternoon were a small increase in forage DM content, a small reduction in N concentration, an increase in starch content but no effect on digestibility.

Table 2. Effects of regrowth intervals and time of day on composition of kikuyu grass in study 2

Sampling time (Australian Eastern Standard Time)	DM content (g/kg)	Total N (g/kg DM)	Water-soluble carbohydrates (g/kg DM)	Starch (g/kg DM)	OMD*
30 day regrowth					
10.30 h	221	19.8	43.8	39.6	0.720
14.15 h	231	20.4	59.2	53.7	0.675
16.15 h	204	19.9	53.6	45.4	0.714
45 day regrowth					
10.30 h	208	19.8	46.0	37.6	0.640
14.15 h	214	18.6	55.3	54.9	0.647
16.15 h	191	17.4	54.7	49.4	0.621
Regrowth	P<0.05	P<0.10	ns	ns	P<0.10
Time of day	P<0.01	ns	P<0.01	P<0.05	P<0.05
Interaction	ns	ns	ns	ns	P<0.01
s.e.d.	7.3	0.86	1.92	5.20	0.0197

4. Conclusions

The benefits of higher WSC content obtained by delaying cutting to the afternoon are small, as WSC levels were still well below the critical value required to ensure a good silage fermentation. In addition, cutting in the afternoon could have a negative effect on the ensiling process by slowing wilting. A slow wilt has been shown to adversely affect the fermentation quality of kikuyu grass.

5. Acknowledgements

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6. Reference

Wilkinson, M. 1990. "Silage UK", 6th edition. Chalcombe Publications, Marlow, UK.