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in

Lindberg J.E. (ed.), Gonda H.L. (ed.), Ledin I. (ed.).
Recent advances in small ruminant nutrition

Zaragoza : CIHEAM

Options Méditerranéennes : Série A. Séminaires Méditerranéens; n. 34

1997

pages 71-74

Article available on line / Article disponible en ligne à l'adresse :

<http://om.ciheam.org/article.php?IDPDF=97606116>

To cite this article / Pour citer cet article

Andueza D., Muñoz F., Delgado I., Treacher T. **Disappearance of dry matter from mature oat crops grazed by ewes in summer: Preliminary results.** In : Lindberg J.E. (ed.), Gonda H.L. (ed.), Ledin I. (ed.). *Recent advances in small ruminant nutrition*. Zaragoza : CIHEAM, 1997. p. 71-74 (Options Méditerranéennes : Série A. Séminaires Méditerranéens; n. 34)



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Disappearance of dry matter from mature oat crops grazed by ewes in summer: Preliminary results

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SUMMARY - The objective of the experiment was to study the rate of disappearance of dry matter from the head, leaf and stem fractions of mature oat crops during grazing by sheep in a semi-arid, non-irrigated region of Aragón (Spain). Between June and August 1995, measurements were made on 30 tillers chosen at random in two plots that were grazed continuously by 17 dry ewes for 50 days in plot 1, and for 21 days in plot 2. On each tiller the height of the stem, length of each leaf and the number of spikelets were measured weekly. The length measurements were converted to weights of the three fractions, spikelets, leaf and stem, using weights of individual spikelets, hereafter termed head, and weights per unit length of leaf and stem obtained dissecting, measuring and weighing segments of 50 tillers selected at random at each sampling date. The results demonstrated differences between the plots in initial weight of tillers and proportions of head, leaf and stem and in the patterns of disappearance of the fractions during grazing.

Key words: Dry matter disappearance, oat crops, grazing, sheep.

RESUME - "Disparition de la matière sèche dans des cultures d'avoine à maturité, pâturées par des brebis en été : Résultats préliminaires". L'objectif de l'expérience a été d'étudier le taux de disparition de la matière sèche dans les fractions de l'épi, feuilles et tiges de cultures d'avoine à maturité pendant le pâturage par des ovins dans une région semi-aride, non irriguée d'Aragon (Espagne). Entre juin et août 1995, des mesures ont été prises sur 30 talles choisies au hasard dans deux parcelles pâturées continuellement par 17 brebis taries pendant 50 jours dans la parcelle 1, et pendant 21 jours dans la parcelle 2. Sur chaque talle, la taille de la tige, la longueur de chaque feuille et le nombre d'épillets ont été mesurés chaque semaine. Les mesures de longueur ont été converties en poids pour les 3 fractions, épillets, feuille et tige, en utilisant les poids des épillets individuels, ci-après dénommés épis, et les poids par longueur unitaire de feuille et de tige ont été obtenus en disséquant, mesurant et pesant des segments de 50 talles choisies au hasard à chaque date d'échantillonnage. Les résultats ont montré des différences entre les parcelles en ce qui concerne le poids initial des talles et les proportions d'épi, de feuille et de tige, et les tendances de disparition des fractions pendant le pâturage.

Mots-clés : Disparition de la matière sèche, cultures d'avoine, pâturage, ovins.

Introduction

Cereals are the main crop in the semi-arid, non-irrigated areas of Aragón. In years with low or very irregular rainfall, growth is poor and crops are not harvested. These unharvested cereal crops provide a considerable amount of grazing in summer, when other sources of forage are scarce. Although the feeding value of cereals has been widely studied, work has been carried out mainly on the whole plant. As sheep graze selectively (Dudzinski and Arnold, 1973), the composition of the diet of animals grazing mature cereal crops may differ considerably from the average composition of the whole plant. In a series of experiments on the use of cereals as grazed feed resources in the Monegros area of Aragón, there were large differences in the growth of cereal crops within the plots, owing mainly to variations in soil depth. These differences in growth led to large errors when crop mass and the proportions of each crop fraction were estimated when sampling with quadrates cut to ground level. To assess the patterns of removal of heads, leaf and stem during grazing it was decided to explore the use of measurements on individual tillers similar to those used by Tallwin *et al.* (1989) on grazed grass tillers.

Materials and methods

In autumn 1994, in a semi-arid region of Aragón, Spain, two plots of 1.33 ha were sown with oats (*Avena sativa*, var. Prevision) using a seed rate of 100 kg/ha and 200 kg/ha of a 15:15:15 fertilizer at sowing. Total rainfall during the 1994/5 growing season was 242 mm, 40% of which fell in the spring. The crops were allowed to reach maturity before grazing started. Each plot was grazed by 17 Rasa Aragonesa dry ewes. Plot 1 was grazed for 56 days, from 6 June to 27 July. Plot 2, which was a regrowth after the crop had been grazed in February and March, was grazed for 21 days, from 1 to 21 August.

Before grazing started on each plot, the herbage mass of the plot was estimated by cutting ten randomly placed quadrates of 0.25 m² to ground level. On plot 1 the mass was estimated again at the end of the grazing period.

Before grazing, 30 tillers were chosen at random and marked with coloured string at the base of the stem. The lengths of the leaves and the stem on each tiller were measured and the number of spikelets in each panicle recorded weekly. The lengths of leaf and stem and numbers of spikelets were converted to quantities of dry matter from the panicle, leaves and stem, by calculating values from 50 randomly selected tillers at each sampling, using the following methods. The spikelets from the panicles of the fifty tillers were counted and weighed, and average weight was calculated. Hereafter, the total weight of spikelets is termed head weight. The weight of leaf lamina per unit length was estimated by cutting the leaves from the fifty tillers into four segments of equal length, S1, S2, S3 and S4, and measuring the total length of lamina in each segment. The segments were bulked into groups S1 to S4, and each bulked sample was dried and weighed. The same procedure was used to estimate stem weight per unit length.

At the beginning and end of each period, the sheep were weighed and their body condition assessed, using the method of Russel *et al.* (1969).

Analyses of variance were made on the weights of the total dry matter and of the head, leaf and stem fractions at each sampling interval, using SAS (1987) and Duncan's test to compare means.

Results and discussion

The initial yields of total forage to ground level were 3.29±0.71 and 2.5±0.78 t/ha for plots 1 and 2, respectively. The total disappearance of dry matter from plot 1, calculated from the difference between the initial and final quadrate samples, was 65%.

Mean weights of head, leaf and stem (mg per tiller) at each sampling are shown in Table 1. The mean tiller weight and proportions of the three fractions differed between plot 1, which had a mature crop of oats that had not been grazed previously, and plot 2, which contained mature plants that had been grazed for two months, in February and March, while the crop was green. Tillers from the previously grazed plot were lighter (580 vs 697 mg) and had a higher proportion of stem (44 vs 24%) and considerably lower proportions of leaf (22 vs 36%) and heads (34 vs 40%).

Figures 1 and 2 show the patterns of disappearance of total dry matter and of each of the fractions during grazing of plots 1 and 2. In these figures the points with different letters indicate significant differences ($P < 0.05$) between sampling. On plot 1, the disappearance of heads decreased rapidly after day 14. The disappearance of leaf increased between the first and third measurements and then remained fairly constant. The disappearance of stem was lower but increased slightly at each successive sampling. Removal of total dry matter increased between the first and third samplings and then declined slightly. The total disappearances of head, leaf and stem over the whole grazing period were 97%, 95% and 72%, respectively.

On plot 2, the rate of disappearance of all fractions was much higher than on plot 1. Comparison of the figures 14 days after the start of grazing, clearly show this difference. This may be due in part to higher grazing pressure on this plot, which had a lower herbage mass at the start of grazing (2.55 vs 3.29 t DM/ha). The patterns of disappearance also differ from those on plot 2. There was a far greater disappearance of head and total dry matter in the first week than in the second, and a slight decrease

between the second and third weeks. Disappearance of leaf and stem was much lower (Fig. 2), and showed very slight decreases in successive weeks. The total disappearances of head, leaf and stem in 21 days were 84%, 84% and 69%, respectively.

The mean initial live weight and body condition score of the sheep were 57.5±11.26 kg and 3.2±0.33 at the start of grazing of plot 1. There was no change during grazing on plot 1, but during the 21 days grazing on plot 2 mean live weight decreased by 2 kg and body condition decreased by 0.4 of a score unit.

Table 1. Mean weights of total dry matter and of head, leaf and stem (mg per tiller) at successive samplings on plots 1 and 2

Sampling	Plot 1				Plot 2			
	Total	Head	Leaf	Stem	Total	Head	Leaf	Stem
Before grazing	697.1 ±124.8	281.5 ±123.6	248.2 ±7.29	167.4 ±6.5	580.4 ±130.1	199.5 ±127.2	126.1 ±8.25	254.8 ±10.2
1	626.1 ±34.0	222.2 ±29.8	240.5 ±6.03	163.5 ±3.1	380.9 ±40.6	48.4 ±33.1	74.03 ±8.6	186.4 ±17.8
2	514.3 ±29.2	129.7 ±25.6	225.2 ±7.0	159.4 ±3.1	199.0 ±29.4	33.63 ±7.8	39.2 ±8.6	126.1 ±20.6
3	368.3 ±35.6	49.51 ±27.5	175.4 ±13.5	143.3 ±6.7	133.9 ±23.4	33.6 ±7.8	20.3 ±8.0	79.03 ±21.6
4	310.8 ±20.6	26.4 ±12.8	152.9 ±6.9	131.5 ±7.3				
5	203.9 ±28.6	9.83 ±10.6	95.44 ±14.1	98.65 ±11.9				
6	126.7 ±20.4	9.83 ±10.6	48.28 ±12.7	65.58 ±10.4				
7	66.17 ±19.7	9.83 ±10.6	12.43 ±10.6	43.91 ±11.8				

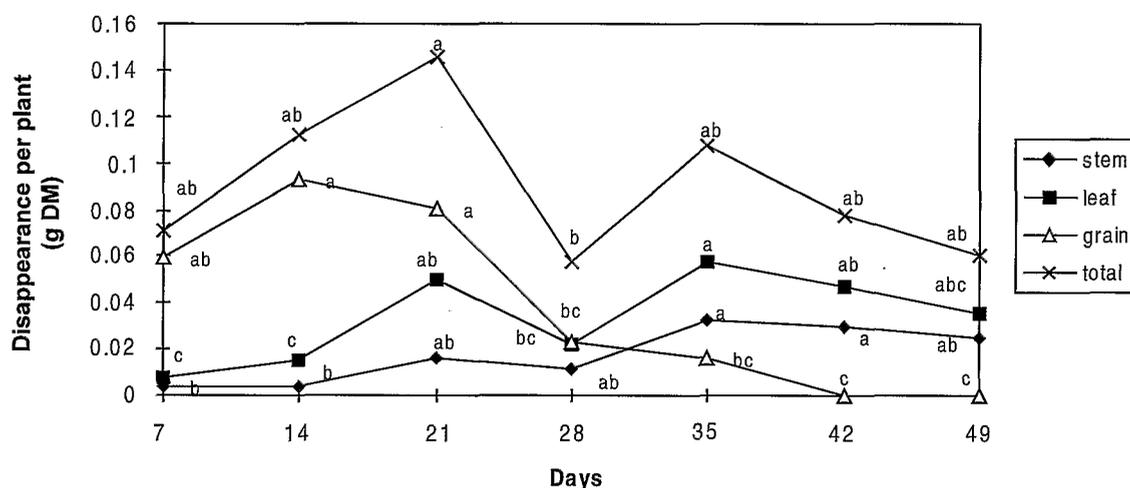


Fig. 1. Disappearance of total dry matter and of head, leaf and stem (g DM) in the first plot.

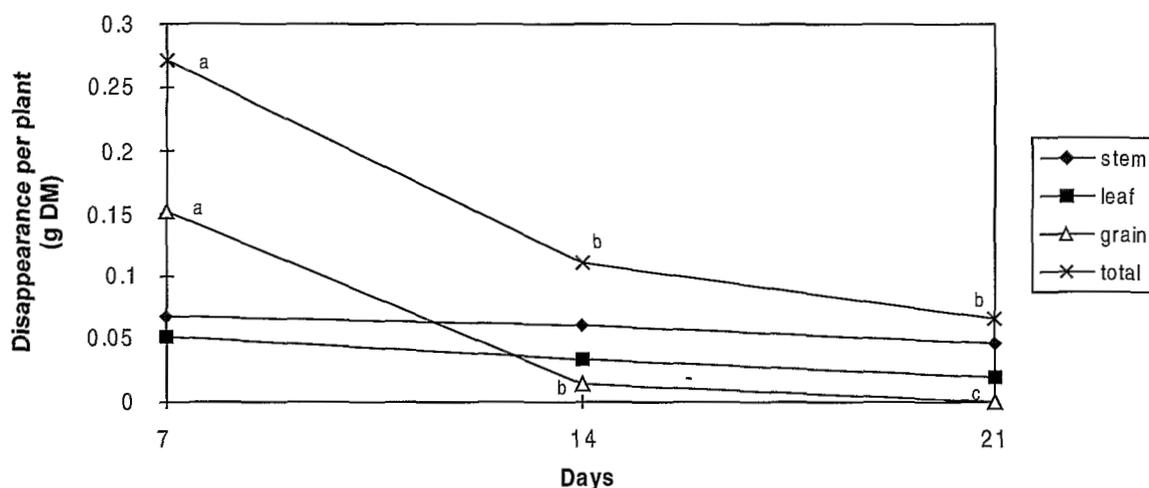


Fig. 2. Disappearance of total dry matter and of head, leaf and stem (g DM) in the second plot.

Conclusions

A modification of the method of Tallwin *et al.* (1989) for estimating the weight of leaf tissue removed by grazing of permanent grass swards was used successfully to estimate removals of head, leaf and stem during grazing of mature oats. Sampling on two areas with different initial forage weights and tiller compositions resulting from previous management showed different patterns of removal of the fractions. The results gave a quantitative description of the proportions of head, leaf and stem in the diets of sheep grazing mature oats.

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