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# Harvest time and cutting height in pure perennial meadows

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**Summary:** In the two-year period 1993-1994, the effects of three harvest times (when plant height reached 10, 15 and 20 cm) and two cutting heights (close to the ground and at 5 cm) were studied on the main quantitative and qualitative yield parameters of two perennial meadows forage crops, grown as dry crops, the sainfoin (*Onobrychis viciaefolia* Scop.) and cocksfoot (*Dactylis glomerata* L.).

In both the species, despite the poor results achieved by cocksfoot in the second trial year, the cutting carried at a height of 15 cm gave the highest green forage and dry matter yields, and good crude protein and neutrodetergent fibre (NDF) contents.

Between the cutting heights, the best results were obtained in the close to the ground cutting.

**Key words:** sainfoin, cocksfoot, forage yield, quality.

## INTRODUCTION

Reviewing the state of Apulian forage cropping, Dionigi and Lanza (1976) reported it to be completely dry and represented by autumn-winter forage crops and permanent pastures.

After 20 years no significant change was observed, whereas there have been considerable transformations in zootechnical breeding. Indeed, after a phase of advanced specialization which involved the introduction of industrial breeding, the trend today is to go back to small and medium breeding, both to reduce the environmental impact due to the extent of the pollution source, and to give priority to yield quality rather than quantity.

Under these conditions, forage growing in Southern Italy can have again a crucial role and size, provided the most appropriate forage systems, the best agronomic techniques of production and utilization are identified for each context.

Our research intends to give a contribution to extend the knowledge in this field, by testing the cutting frequency and height for the grass produced by pure perennial meadows of grasses and forage leguminous. It is, indeed, well-known that the changes in these factors may have a significant effect on biomass yield and forage quality (Corleto, 1985; Onofrii *et al.*, 1987; Cavallero *et al.*, 1991; Vecchietini *et al.*, 1991), as well as on the cropping cycle length and on the crop persistence over time.

## MATERIALS AND METHODS

### The site

The research started in winter 1991 and will end in 1995; in this note the results obtained in the two first years (1992 and 1993) are reported.

The trial was conducted in the "Agostinelli" experimental farm of the Institute, located in Rutigliano (41° 01' latitude, 4° 39' longitude, 122 m a.s.l.).

The soil, whose physical, chemical and hydrological characteristics are reported in Table 1, is classified as Rhodoxeralf Lithic Ruptic (according to the Soil Taxonomy USDA, 1975).

The climate is an "accen-tuated thermomediterranean" (Unesco - FAO clas-sification), with low rainfall mostly occurring in winter months.

During the trial period, the weather was characterized by a total rainfall of 458.9 mm in 1992 and 511.4 in 1993, against 618.3 mm, observed in the previous reference period 1977-1991, and by mean monthly temperatures that were 1° and about 0.6 °C above the pluriannual average, in the first and in the second year respectively.

In particular, with reference to the March-July period, the most important for the effect of water supply on the growth rate of re-growth and on the subsequent number of cuttings, in 1992 very effective rainfall was observed in April (81.8 mm) and in June (79.0 mm); the former made possible a good number of cuttings in both species, particularly in May, and the latter, unusual in the trial area, enabled satisfactory yields to be achieved till late July. In 1993, instead, a high rainfall was observed only in March (93.8 mm), whereas in the four remaining months, the rainfall distribution was better, although values were not too high.

### Treatments and experimental design

Three harvest times (carried out when the plants reached, on the average, 10, 15 and 20 cm height) and two cutting heights (close to the ground and at 5 cm), arranged in the field on a split-plot design with three replicates, were compared, under dry conditions, on two permanent meadow species, the sainfoin (*Onobrychis viciaefolia* Scop., cv. Vala) and the cocksfoot (*Dactylis glomerata* L., cv. Dora).

Sowing was performed from 3 to 5 December 1991, in 6 m<sup>2</sup> elementary plots, with a row spacing of 15 cm; 80 kg.ha<sup>-1</sup> and 50 kg of seeds were used for legumes and grasses, respectively.

Fertilization was provided using 100 kg.ha<sup>-1</sup> of P<sub>2</sub>O<sub>5</sub> applied in autumn, at the ploughing time, and 40 kg.ha<sup>-1</sup> of N, applied only to cocksfoot as top dressing, at vegetative resumption.

At harvest, which was performed as the tested species reached the pre-selected heights, the green forage production was determined on the whole plot area, excluding two exterior rows of plants; afterwards, the dry matter content was measured on 1,000 g samples of green forage, oven-dried at 105 °C till a constant weight and the crude protein and neutrodetergent fibre (NDF) contents were determined after oven-drying at 80 °C from 100 g samples.

### RESULTS AND DISCUSSION

Table 2 shows that the sainfoin showed, for all yield and quality parameters, the best responses in the second trial year, with statistically significant differences, thus confirming the ability to achieve the best yields in the second year from sowing; in 1993, a higher number of cuttings equal, for the three cutting times, to 5, 4 and 3 against 4, 3 and 2 of the previous year, was effected.

For what the cutting times are concerned, the best results for green forage and dry matter yields were obtained at 15 cm plant height, whereas for protein and fibre contents, the most satisfactory values were obtained when plants were cut at a height of 10 cm; as a whole, the first seems to show the best yield/quality balance.

Between the cutting heights, within each harvest time, the one close to the ground allowed green forage and dry matter values 35% higher for both parameters, without any negative effect on the growth rate of subsequent regrowth and on the total number of cuttings, which was equal, in both the trial years and for all the three harvest times, to the one obtained when plants were cut at 5 cm.

Concerning the protein and fibre contents, the differences between the two cutting heights were negligible and not significant.

Always in the sainfoin, the « treatments x years » interactions (which resulted to be significant) (fig.1) show that the cutting at 15 cm height exceeded the one at 20 cm in the dry matter yield in the first year, whereas in the second one the reverse was observed; the protein content got constantly worse in both years as the cutting height increased; the superiority of the close to the ground cutting in terms of dry matter yield was sharp both in 1992 and 1993.

Cocksfoot results were worse, with fairly good yields in the first year and no yield in the second one (Table 3), when it displayed a severe suffering state at vegetative resumption after

winter, allowing in the whole cropping season only 2, 1 and 1 cuttings, respectively for the three harvest times.

This is why results were not statistically analysed. In 1992, instead, the cuttings were 5, 4 and 3 with acceptable yields both in size and in terms of quality; that year, the different cutting times did not cause any differentiation in the cocksfoot response, whereas some influence was observed for the cutting height, with the close to the ground cutting being more performing, especially in terms of green forage and dry matter yields.

### CONCLUSIONS

The results obtained in the first two-years period of this research seemed to be particularly interesting, although it is not yet possible to express a definite judgement on the choice of the most appropriate harvest time and height unless the effects of these two factors are tested on the persistence time of the two species under analysis.

Both in cocksfoot and in sainfoin, although to a lower extent, the 15 cm cutting time proved its superiority, since it enabled good yields and satisfactory crude protein and neutrodetergent fibre contents to be obtained.

Between the cutting heights, the superiority of the close to the ground one seems to be well-defined in both species since it provided good results not only in terms of yields but also from a qualitative perspective, despite the higher per cent incidence of stems, richer in fibre and more protein-deficient.

*Table 1. Physical, chemical and hydrological soil characteristics of experimental field.*

Shells	4.2%
Fine soil	95.8%
Coarse sand	2.9%
Fine sand	21.1%
Clay	51.2%
Silt	20.6%
pH	7.4%
Total N	0.134%
Organic matter	2.37%
Available P (as P <sub>2</sub> O <sub>5</sub> )	51 ppm
Exchangeable K (as K <sub>2</sub> O)	715 ppm
Water field capacity (0.03 MPa)	30.68%
Wilting point (1.50 MPa)	18.26%

*Table 2. Effects of treatments on quanti-qualitative parameters of sainfoin.*

	Green forage (t.ha <sup>-1</sup> )	Dry matter (t.ha <sup>-1</sup> )	Protein content (% d.m.)	NDF content (% d.m.)
<b>YEAR</b>				
1992	14.3 b	3.4 b	19.0 b	24.9 b
1993	31.3 a	6.4 a	23.2 a	30.2 a
<b>HARVEST TIME</b>				
10 cm	20.5 c	4.2 b	23.5 a	26.7 b
15 cm	24.5 a	5.3 a	20.7 b	28.2 a
20 cm	23.4 b	5.2 a	19.2 c	27.8 a
<b>CUTTING HEIGHT</b>				
0 cm (Close to the ground)	26.0 a	5.6 a	20.9 a	28.1 a
5 cm	19.6 b	4.2 b	21.3 a	27.0 a

Student - Newman - Keuls test (P ≤ 0.05)

Table 3. Effects of treatments on quanti-qualitative parameters of cocksfoot.

	Green forage (t.ha <sup>-1</sup> )	Dry matter (t.ha <sup>-1</sup> )	Protein content (% d.m.)	NDF content (% d.m.)
<b>YEAR</b>				
1992	10.2	2.3	17.1	45.4
1993	2.4	0.7	8.7	49.2
<b>HARVEST TIME*</b>				
10 cm	10.0 a	2.1 a	18.2 a	44.1 a
15 cm	10.1 a	2.5 a	16.1 a	45.3 a
20 cm	10.4 a	2.3 a	17.1 a	46.9 a
<b>CUTTING HEIGHT*</b>				
0 cm (Close to the ground)	12.0 a	2.6 a	17.5 a	45.7 a
5 cm	8.4 b	2.0 b	16.8 a	45.2 a

Student - Newman - Keuls test ( $P \leq 0.05$ )

\*ANOVA effected only on the results of 1992.

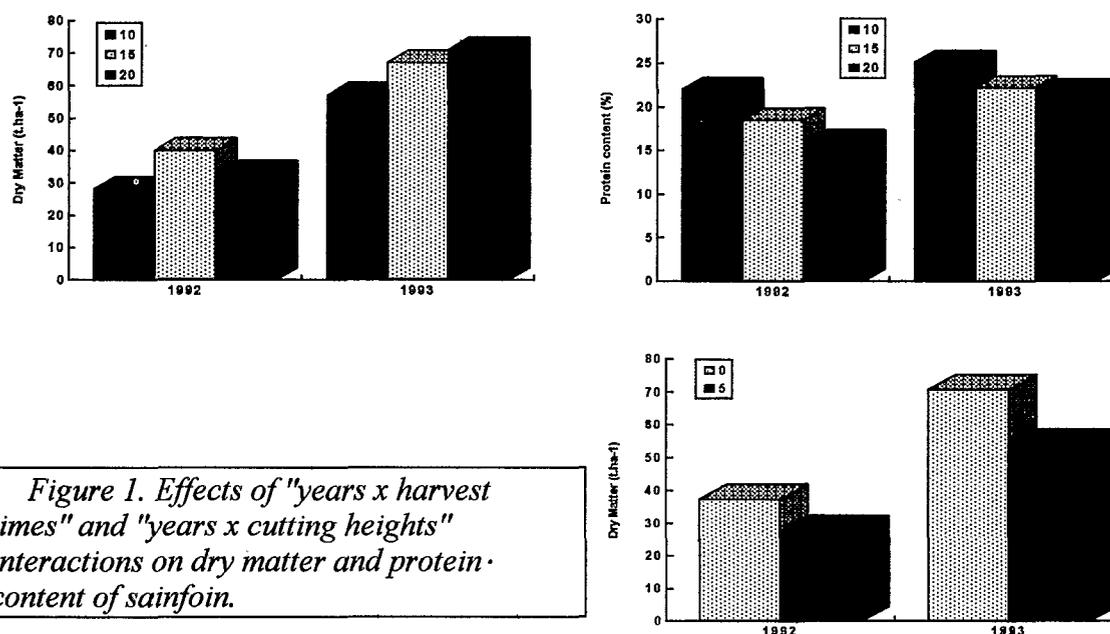


Figure 1. Effects of "years x harvest times" and "years x cutting heights" interactions on dry matter and protein content of sainfoin.

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