In this work the main interest was focused on the microsomal-postmicrosomal and supernatant fractions. For that reason no efforts were made to purify the nuclear and mitochondrial fractions. The nuclear fraction was undoubtedly contaminated by whole cells and cell fragments and the mitochondrial fraction displayed in the electron microscope considerable microsomal contamination. Consequently, the values of nuclear iodine-131 content should be judged critically and the iodine-131 content found in the mitochondrial fraction should at least largely be ascribed to contaminating microsomes.

Electron microscopical examination of the microsomal-postmicrosomal fraction showed no contamination by mitochondria but an unvarying composition of free and membrane-bound RNP-particles. Therefore, the figures of iodine-131 content of this fraction and the supernatant fraction should be considered reliable and make following conclusions legitimate. Single and repeated doses of TSH were followed by increased iodine-131 content of the thyroid, the greater part of the radioiodide being bound to protein. The protein-bound iodine-131 content of the microsomal-postmicrosomal fraction increased more than that of the supernatant fraction, resulting in a raised microsomal protein-bound iodine-131/supernatant protein-bound iodine-131 ratio.

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V. PANTIĆ
R. EKHOLM

Department of Anatomy,
University of Gothenburg, Sweden.

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BIOLOGY

Soluble Carbohydrate Content of Varieties of Tetraploid Ryegrass

THE soluble carbohydrate content of forage grasses is of interest to the agronomist both because of its effects on the nutritive value of grass as a food for livestock, and because of its apparent relationship with palatability. Bland and Dent¹ found a correlation between sugar content and palatability in six varieties of cocksfoot, the most palatable varieties having the highest sugar content.

In 1962 two varieties of tetraploid perennial ryegrass bred in Holland were included in the grass variety trials at this Institute. Botanically these varieties differ from diploid varieties in that they have a larger seed size, a lower tillering capacity and a higher moisture content in the foliage. Chemical analysis of samples from the Institute's trials at Cambridge and Trawscoed (Wales) has shown that these tetraploid varieties are consistently higher in soluble carbohydrate content than equivalent diploid varieties. Results are given in Table 1 in which the tetraploid early hay variety, Reveille, is compared with S.24 and the tetraploid pasture variety, Petra, is compared with S.23. One series of plots was cut 8 times during the year and data are available for all cuts except fourth and fifth which gave very low yields due to drought. The soluble carbohydrate content of Reveille was higher than that of S.24 for all six cuts at both Cambridge and Trawscoed. At Cambridge the difference between the mean values was 4 per cent and at Trawscoed the difference between means was 3 per cent. In both cases the difference was statistically significant. A similar pattern of results was obtained in the comparison between Petra and S.23.

To ensure that the control varieties used were reasonably representative of diploid perennial ryegrass varieties

Table 1. SOLUBLE CARBOHYDRATE CONTENT AS A PERCENTAGE OF DRY-MATTER IN RYEGRASSES
Perennial ryegrass (1962)

	Diploid S.24	Tetraploid Reveille	Diploid S.23	Tetraploid Petra	Mean of all 24 diploid varieties
Cambridge					
1st cut, 2.5.62	28.0	36.3	24.0	37.2	30.8
2nd cut, 16.5.62	15.1	18.9	12.3	18.9	15.5
3rd cut, 1.6.62	20.6	26.0	20.8	24.6	20.8
4th cut, 15.6.62	—	—	—	—	—
5th cut, 2.7.62	—	—	—	—	—
6th cut, 31.7.62	5.8	7.7	6.8	7.1	7.0
7th cut, 30.8.62	8.9	11.5	8.5	11.5	—
8th cut, 1.10.62	12.1	15.0	12.4	16.6	—
Mean of 6 cuts	15.2	19.2	14.1	19.3	—
Standard error			± 0.85		
Sig. diff. (P = 0.05)			2.57		
Hay cut	16.7 (30.5.62)	26.0 (4.6.62)	15.7 (22.6.62)	19.9 (22.6.62)	17.2
Trawscoed (Wales)					
1st cut, 30.4.62	29.5	35.6	29.5	34.0	—
2nd cut, 14.5.62	11.4	15.4	13.6	14.8	—
3rd cut, 31.5.62	21.6	22.8	19.0	23.2	—
4th cut, 14.6.62	—	—	—	—	—
5th cut, 29.6.62	—	—	—	—	—
6th cut, 31.7.62	13.3	13.7	14.2	14.9	—
7th cut, 30.8.62	11.6	15.5	12.4	14.5	—
8th cut, 2.10.62	15.0	17.4	15.8	17.4	—
Mean of 6 cuts	17.1	20.1	17.4	19.8	—
S.E.			± 0.48		
Sig. diff. (P = 0.05)			1.46		
Hay cut	28.6 (23.5.62)	33.6 (31.5.62)	29.6 (22.6.62)	26.2 (25.6.62)	26.0
Italian and Westerwolds ryegrass (1962)					
	Diploid S.22	Tetraploid Tetrone	Diploid Mommesteeg's Westerwolds	Tetraploid Billion Westerwolds	
Cambridge					
1st cut, 12.4.62	18.9	24.1	17.1	19.9	

an analysis for soluble carbohydrate content was made on all 24 diploid varieties in the trial at Cambridge for cuts 1, 2, 3 and 6. Although the control varieties were slightly below the average of the 24 varieties in soluble carbohydrate content, the tetraploids were clearly above average in 3 cuts out of 4.

In a parallel series of plots each variety was cut for hay 10 days after 50 per cent of its flowering stems had emerged. The results from the analysis of these samples, with one exception, also showed the tetraploid varieties to be above average in soluble carbohydrate content.

In another trial at Cambridge in 1962 a tetraploid variety of Italian ryegrass (Tetrone) and a tetraploid variety of Westerwolds ryegrass (Billion) were compared with diploid varieties of a similar type. The results of an analysis of material cut from these plots in April 1962 also showed a higher soluble carbohydrate content in the tetraploid varieties.

The soluble carbohydrate determinations were carried out on oven-dried samples by an anthrone method based on that described by Fairbairn². While it has been shown that oven drying may cause minor alterations in sugar content³ the method is the only practical one for field trial work, and the consistent varietal differences recorded here are too great to be attributed to experimental error of this type.

These findings are of particular interest in view of recent reports that tetraploid grasses are very palatable to livestock. On our own trial-ground hares and rabbits have shown a remarkable preference for plots of tetraploid grasses distributed at random among a wide range of other varieties.

These results also have a more general significance in that they show for the first time that the production of autotetraploids in the ryegrasses has resulted in varieties which are not only distinctive in their botanical and agronomical characteristics but which also have distinctive characteristics in their chemical composition.

J. W. DENT

D. T. A. ALDRICH

National Institute of Agricultural Botany,
Huntingdon Road, Cambridge.

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