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SOME OBSERVATIONS ON FEEDING BEHAVIOUR OF GROWING RABBITS*

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Introduction

The feeding behaviour of rabbit is influenced by many factors, whether endogenous or exogenous; among these, a prominent role is ascribed to temperature and photoperiod.

Literature references on this subject are scarse (Castellò,1983; Gallouin, 1984; Gardini,1977; Hörnicke et alii, 1976; ; Prud'hon et alii, 1978; Prud'hon, 1976; Reyne et alii 1979; Reyne and Prud'hon, 1981) and those referring to practical situations lack at all; therefore this research was carried out to obtain knowledge about the influence of the environmental factors.

Material and methods

In order to study the feeding behaviour of growing rabbits with respect to season and period of the day, 384 N.Z.W. animals of both sexes were utilized ; they were observed from the 30th to the 80th day of age. Eight feeding trials were executed during two successive years, two per season. Rabbits were put inside individual cages and fed, ad libitum, a commercial

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fodder with the following chemical composition (on a dry matter basis): crude protein 16.74%, ether extract 2.81%, crude fibre 17.13%, ash 8.77%, N-free extract 54.55%, gross energy 17.96 MJ/kg.

The diet was admistered three times a day: 8, 13 and 18 o'clock.Residual feed was weighed each time and every ten days animals were weighed. In order to complete the research, six digestibility trials were carried out, during summer, autumn and winter (two in each season). In autumn and winter the ingesta-excreta balance was made separately in diurnal (8-18 h) and in nocturnal periods (18-8 h).Research was carried out in a non-air-conditioned environment, with only moderate heating during the winter. Temperature and relative humidity were always recorded.Statistical analysis of data was made by least squares analysis of variance (Pilla,1985).

Discussion of results

Analysis of variance (table 1) showed the influence of variables on the considered parameters. With reference to year, initial weight, daily feed intake, feed conversion, feed ingested between 8 h and 13 h and between 18 h and 8 h varied significantly. Season influenced all parameters significantly; on the contrary, sex had no effect. Year x season interaction was significant for almost all parameters.

Data in table 2 show that weight gains were always satisfactory, with the minima in the summer and with significant differences from year to year. Feed intake (g/d and g/d/l.w.$^{.75}$) changed significantly from year to year, while influence of season was conspicuous only in the summer, when minimum values were obtained.

Correlations among feed intake, temperature and humidity gave significant and negative values ($r = -0,275^{**} \div -0,573^{**}$) only with reference to temperature, confirming the well-known effects of summer heat.

Regarding feed intake with respect to the period of the day (table 3), differences were attributable either to year or to season, with significant interaction.In general, ingestion levels fluctuated from 6% to 11% in the interval 8-13 h, from 10% to 22% in the interval 13-18 h, from 69% to 82% in

the interval 18-8 h. Another noteworthy fact is that nocturnal feed intake increased remarkably in the summer reaching 82% in contrast to a minimum of 69% in autumn 1986.

Results of digestibility trials (table 4) showed no significant differences with respect to season.Althought not significant, it can at all be noted that the best apparent digestibility coefficients were obtained in autumn and the worst ones in summer, when animals are debilitated because of high temperatures.In connection with the period of the day , significant differences were achieved, due to the fact that feed was utilized much better during diurnal hours; this was more emphasized in winter. Differences were very great for fibre and its components. Better digestibility between 8 and 18 h can be ascribed to the low quantities of feed which passed through the digestive system; in fact, in such an interval, animals ate about 28% of the feed they ingested during the entire day.

Conclusions

On the basis of these results, it is possible to say the following:

- the feeding behaviour of growing rabbits is influenced by season, but variations are clearly evident only in summer, when a significant decrease in feed intake takes place, which negatively affects weight gain. On the contrary, in winter the ingestion level can increase so much as gets disadvantageous feed conversion;
- temperature is the essential microclimatic factor affecting feed intake;
- feed ingestion is prevalently nocturnal because from 18 to 8 h rabbits eat about 74% of the total, reaching 82% in summer;
- apparent digestibility coefficients are not significantly influenced by season but they are affected by period of the day, reaching significantly higher values in the interval 8 - 18 h;
- environmental conditioning is very important in order to regulate feed intake of growing rabbits.

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Table – 1 – Significance of observed variability sources.

Variability sources	Initial weight	Final weight	Daily weight gain	Daily feed intake	Feed conversion	Feed intake with respect metabolic weight	Percent feed intake during periods : 8-13 h	13-18 h	18-8 h
Year	18.66**	<1	2.12	22.95**	22.16**	50.55**	15.99**	<1	6.65*
Season	20.18**	34.20**	24.92**	125.73**	120.97**	143.62**	77.72**	206.80**	339.20**
Sex	<1	1.82	2.15	<1	<1	<1	<1	1.54	1.58
Year x season	20.77**	1.67	12.76**	26.08**	102.59**	34.83**	10.33**	4.05*	<1
Year x sex	<1	<1	<1	<1	<1	2.37	<1	<1	1.61
Season x sex	2.52	<1	<1	<1	<1	<1	<1	<1	1.25
Year x season x sex	<1	<1	<1	<1	2.91	<1	<1	<1	<1

* $P \leq .05$

** $P \leq .01$

Table – 2 – Least square means (± s.d.) of considered parameters.

Season / Parameter	SPRING '85	SPRING '86	SUMMER '85	SUMMER '86	AUTUMN '85	AUTUMN '86	WINTER '85	WINTER '86
Number of rabbits	48	48	49	48	48	48	48	48
Initial weight, g	^{C}620.65±81.31	^{B}589.26±164.92	^{A}480.90±41.37	^{BC}580.00±39.09	^{BC}583.75±134.94	^{B}547.50±99.50	^{BC}598.02±111.83	^{D}720.73±89.40
Final weight, g	^{B}2296.74±251.67	^{B}2399.71±310.27	^{A}2018.85±180.28	^{B}2106.97±30.34	^{B}2336.25±320.46	^{B}2390.50±239.40	^{B}2421.88±221.69	^{B}2400.72±212.69
Weight gain, g /d	^{B}33.52±4.74	^{C}36.81±3.85	^{A}30.76±3.16	^{A}30.34±3.05	^{BC}35.05±5.23	^{C}36.98±4.71	^{C}36.46±3.07	^{B}33.60±4.01
Feed intake, g /d	^{D}129.07±15.14	^{C}119.08±17.37	^{A}90.93±8.27	^{B}104.01±7.68	^{D}130.37±20.32	^{E}140.13±23.59	^{E}146.30±12.50	^{D}129.84±12.53
Feed conversion	^{D}3.85±0.31	^{B}3.23±0.26	^{A}2.96±0.18	^{C}3.43±0.20	^{D}3.72±0.30	^{D}3.79±0.32	^{E}4.01±0.22	^{D}3.86±0.28
Food intake, g/d/kg l.w.	^{DE}97.24±10.80	^{C}90.98±15.65	^{A}75.87±6.53	^{B}89.53±10.41	^{EF}101.11±8.91	^{G}105.97±9.15	^{FG}104.08±7.01	^{CD}93.45±11.23
Mortality %	2.08	10.00	4.17	6.25	0	10.98	8.33	8.33

Values on the same line with different letters are significantly different for P ≤ .01

Table 3 - Average percentages (± s.d.) of feed intake during 3 periods of the day.

Season \ Period, h	8 - 13	13 - 18	18 - 8
Spring 1985	$9.34^{C} \pm 2.47$	$18.28^{BC} \pm 3.48$	$72.38^{B} \pm 3.55$
Spring 1986	$9.31^{C} \pm 2.29$	$17.72^{B} \pm 4.17$	$72.97^{B} \pm 4.05$
Summer 1985	$7.60^{B} \pm 2.14$	$10.41^{A} \pm 4.02$	$81.99^{C} \pm 3.36$
Summer 1986	$6.04^{A} \pm 1.52$	$11.93^{A} \pm 3.58$	$82.03^{C} \pm 3.45$
Autumn 1985	$11.23^{D} \pm 2.32$	$17.80^{B} \pm 3.11$	$70.97^{AB} \pm 3.43$
Autumn 1986	$8.75^{BC} \pm 1.17$	$22.29^{D} \pm 2.73$	$68.96^{A} \pm 2.55$
Winter 1985	$9.25^{C} \pm 3.13$	$20.17^{C} \pm 1.90$	$70.58^{AB} \pm 4.10$
Winter 1986	$10.06^{CD} \pm 1.70$	$19.82^{C} \pm 2.96$	$70.12^{A} \pm 3.06$

Values on the same column with different letters are significantly different for $P \leq .01$

Table 4 - Least square means (± s.d.) of digestibility coefficients with respect to season and period of the day.

	Summer	Autumn	Winter	Autumn		Winter	
				Day	Night	Day	Night
Number of rabbits	12	12	12	12	12	12	12
Dry matter	55.75±0.76	65.16±0.59	60.45±0.76	74.38^{A}±1.84	62.71^{B}±1.84	84.13^{C}±1.92	50.24^{D}±1.84
Organic matter	56.98±0.73	65.82±0.57	61.12±0.73	74.77^{A}±1.82	62.89^{B}±1.82	84.53^{C}±1.90	51.03^{D}±1.82
Crude protein (N x 6.25)	71.98±0.74	75.66±0.57	66.63±0.74	81.65^{A}±1.49	75.54^{B}±1.49	84.64^{A}±1.56	58.48^{C}±1.49
Ether extract	70.67±1.01	80.20±0.78	70.43±1.01	88.30^{A}±1.12	80.16^{B}±1.12	89.39^{A}±1.17	62.33^{C}±1.12
Crude fibre	15.76±1.91	34.31±1.48	29.92±1.91	56.31^{A}±4.32	32.36^{B}±4.31	73.03^{C}±4.50	10.48^{D}±4.31
Ash	42.90±1.59	58.38±1.23	53.65±1.59	70.44^{A}±2.11	60.82^{B}±2.11	80.29^{C}±2.21	42.11^{D}±2.11
N - free extract	64.61±0.64	72.25±0.50	68.74±0.64	79.05^{A}±1.56	68.79^{B}±1.56	87.83^{C}±1.63	60.93^{D}±1.56
ADF	14.67±1.50	31.36±1.16	30.78±1.50	49.72^{A}±3.49	24.68^{B}±3.49	73.16^{C}±3.65	12.92^{D}±3.49
Cellulose	19.02±1.52	38.01±1.18	35.48±1.52	54.77^{A}±3.32	31.11^{B}±3.32	75.26^{C}±3.47	18.31^{D}±3.32
Energy	55.62±0.78	66.21±0.61	59.51±0.78	74.41^{A}±1.89	62.67^{B}±1.89	83.70^{C}±1.97	48.99^{D}±1.09
Initial weight,g	2289.17±18.41	2474.00±133.12	2514.58±178.62				
Feed intake, g d.m./d	118.48±18.41	154.63±27.35	132.07±20.27				
Feed intake, %				27.24±5.08	72.76±5.08	29.22±4.52	70.78±4.52

Values on the same line with different letters are significantly different for $P \leq .01$

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The effect of season and of hour of the day on feeding behaviour of growing rabbits was studied. Eight feeding trials and six digestibility trials were carried out. Daily feed intake/kg l.w.$^{.75}$ did not show differences between sexes; the seasonal effect was mainly observed in summer, when the lowest feed intake was recorded. During the different hours of the day, feed intake was: 9% from 8 to 13 h, 17% from 13 to 18 h and 74% from 18 to 8 h. A seasonal effect was also observed : during the night hours, the animals consumed 82% of the diet in the summer while in the winter they consumed 70%. Digestibility trials did not show any significant seasonal effect, but best results were obtained in autumn and the worst in summer. Instead, significant differences were observed with respect to the period of the day: in fact, the diet was utilized much better during diurnal hours because of the small feed quantity passing through the digestive tract.

E' stato studiato il comportamento alimentare del coniglio in accrescimento in rapporto alla stagione e all'ora della giornata, eseguendo 8 prove di alimentazione e 6 prove di digeribilità. Per quanto concerne il consumo giornaliero di alimento/kg p.v.^{0,75} non sono state evidenziate differenze tra sessi, mentre l'effetto della stagione è stato marcato soltanto nel periodo estivo, quando si è ovviamente registrato il consumo più basso. In rapporto all'ora della giornata, dalle 8 alle 13 il consumo di alimento ha rappresentato il 9% del totale, dalle 13 alle 18 il 17% e nelle restanti 14 ore il 74%. Anche in questo caso la stagione estiva ha manifestato la sua influenza nel senso che gli animali hanno mangiato l'82% della dieta durante le ore notturne, mentre in inverno ne hanno ingerito solo il 70%. Le prove di digeribilità non hanno messo in evidenza alcun effetto significativo attribuibile alla stagione, anche se i migliori risultati sono stati conseguiti in autunno e i peggiori in estate. Sono state invece ottenute differenze significative in rapporto al periodo della giornata, ovvero la dieta è stata utilizzata molto meglio durante le ore diurne come conseguenza del fatto che sono state modeste le quantità di alimento in transito nel tubo digerente.