

Effect of different levels of concentrate supplementation on the production performance of Angora rabbits

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ABSTRACT

Experiment was conducted on 54 adult male German Angora rabbits distributed into 3 groups of 18 rabbits in each. Rabbits in T₁ were given 140 g pellet feed whereas in T₂ and T₃ groups were given 110 and 80 g pellet/day. The rabbits in all the groups were given *ad lib.* fresh wilted roughage. Feed intake and body weight was monitored fortnightly. Rabbits were weighed and sheared after 75 days interval and the experiment was conducted for 375 days up to 4 consecutive shearings. Wool production of 5 consecutive shearings was recorded. Initial body weights of rabbits were 3.13 kg, 3.12 kg and 3.04 kg in T₁, T₂ and T₃ groups, which were 3.28 kg, 3.03 kg and 3.07 kg, respectively, in these groups by the end of fifth shearing. Level of concentrate in the diet did not have any marked effect on body weight. The annual wool yield was 803 g, 772.4 g and 767.4 g in T₁, T₂ and T₃ groups, which was significant among treatments, although there were no differences between T₂ and T₃ groups. Significant differences were recorded for daily dry matter intake between groups, and also for the digestibility of dry matter, crude fibre and ether extract. Per cent mortality was 11.1 each in T₁ and T₂ and 27.8 in T₃ group. Dry matter required for producing 100 g wool was 7.35 kg in T₁, 6.46 kg in T₂ and 5.62 kg in T₃ group. It is concluded that as almost similar wool production and mortality was observed in groups fed 110 and 140 g concentrate per day along with fulfilling the daily protein requirement, feeding of 110 g of concentrate was found adequate in adult rabbit for economical Angora rabbit production.

Key words: Angora rabbit, Balance, Digestibility, Pellet, Wool production

Fulfilling nutritional needs is a prerequisite for harnessing the full genetic potential of Angora rabbits. Hence both feed quantity and quality have importance in feed management techniques for achieving higher wool yield. As feed cost accounts for more than 60% of total recurring cost, a small saving may make the angora farming more successful. The disadvantage with *ad lib.* feeding as compared to balanced feeding is that it not only increases the feeding cost but also causes unnecessary fattening which hampers reproduction. Maertens (1992) optimized the restricted quantity of concentrate to the adult males and non breeding females as 35 g/day/kg live weight in broiler rabbits. However, for Angora rabbit such information is not available. Therefore, the present experiment was planned to work out the level of concentrate feeding to adult Angora rabbits to optimize production.

MATERIALS AND METHODS

Adult Angora male rabbits (54) of German Angora breed

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were divided into 3 equal groups of 18 animals each. They were offered 140 g (T₁), 110 g (T₂) or 80 g (T₃) concentrate pellet feed along with *ad lib.* green grass (*Festuca arundinacea*, *Lolium perene*, *Trifolium repens*, *Paspalum* sp., *Puereria thunbergiana*, *Panicum* sp. *Themeda* sp. and *Setaria* sp.) per day. The ingredient composition of pelleted concentrate mixture was groundnut cake 15, mustard cake 5, sunflower cake 5, soyflakes 5, maize 25, wheat bran 15, deoiled rice bran 15, fish meal 1.5 and common salt 0.5 parts. Rabbits were offered concentrate with a standardized scoop daily and their dry matter intake was recorded once a week. The experiment was conducted for 375 days. The animals were weighed and sheared before start of experiment. Thereafter the animals were weighed and sheared at an interval of 75 days. The wool samples were taken from the dorsal surface of each rabbit for quality evaluation. After second shearing, a 5-day digestibility trial was conducted on 4 representative rabbits from each group. During the trial the total concentrate and grass intake were recorded, faeces voided out were collected and weighed daily. Urine samples were collected, measured and samples were taken for nitrogen estimation. Fresh faecal samples were collected for crude

protein and dry matter estimation. The feed, grass and feces were analyzed for proximate principles (AOAC 1990) and fibre fractions (Goering and Van Soest 1984). Wool samples collected were studied for staple length (cm) with scale after fixing sample on the board. The dry matter required for producing 100 g wool was calculated for studying comparative economics. The data were analyzed statistically (Snedecor and Cochran 1994).

RESULTS AND DISCUSSION

The composition of experimental diets were 22.92% crude protein, 7.05% crude fibre, 3.37% ether extract, 7.93% total ash, 58.73% nitrogen free extract, 18.40% acid detergent fibre and 13.20% cellulose. Roughage fed was a mixture of cultivated and seasonal grasses having 10.50% crude protein, 21.05% crude fibre, 2.40% ether extract, 10.30% total ash, 55.75% nitrogen free extract, 36.06% acid detergent fibre and 31.93% cellulose. The rabbits were fed as per the standard (NRC, 1977).

The differences between groups in the initial body weight of rabbits were statistically non-significant (Table 1). Body weight decreased in all the groups during first shearing, which was due to summer stress. Similar summer stress was also reported in Angora (Bhatt *et al.* 1999) and broiler rabbits (Stephen *et al.* 1979) stating that higher environmental temperature resulted in lower wool yield in angora rabbits

Table 1. Body weight, wool yield and plane of nutrition in rabbits

Parameters	T ₁	T ₂	T ₃	Standard Error
<i>Body weight (kg)</i>				
Initial	3.06	3.05	3.08	0.05
First shearing	2.98	2.91	2.84	0.06
Second shearing	3.04	3.08	3.19	0.26
Third shearing	3.07	3.00	3.09	0.18
Fourth shearing	3.37	3.13	3.15	0.27
Fifth shearing	3.28	3.03	3.07	0.29
<i>Wool yield (g)</i>				
First shearing	161.4	159.2	154.6	6.7
Second shearing	136.6	141.3	129.3	5.0
Third shearing	155.3	146.9	145.3	4.8
Fourth shearing	187.7	165.0	177.4	7.2
Fifth shearing	162.0	160.0	160.8	5.9
Av. Wool yield/shearing	160.6	154.5	153.5	4.8
Annual wool yield (g)	803.0 ^a	772.4 ^b	767.4 ^b	6.4
Wool yield/kgW ^{0.75}	68.2	67.3	66.2	3.2
Mortality (No.; %)	2 (11.1)	2 (11.1)	5 (27.8)	
Staple length (cm)	5.40 ^a	5.20 ^b	5.09 ^b	0.07
<i>Plane of nutrition (g dry matter intake/day)</i>				
Concentrate intake	118.1	94.9	70.3	1.4
Roughage intake	39.4	38.2	44.8	3.6
Total	157.5	133.1	115.1	2.5

Values with different superscripts in a row differ significantly (Pd≤0.05).

and is related to higher fibre density and longer fibre in colder compared to warmer climates. The body weights of rabbits during second, third, fourth, and fifth shearing did not changed much within the group and remained statistically similar among groups. Increased amount of nutrients in terms of higher concentrate in T₁ and T₂ as compared to T₃ did not result in higher body weight in adult angora rabbits and this may be due to the differences in digestibility of energy yielding components. These results are in contrast to grower broiler rabbits where *ad lib.* concentrate fed rabbits yielded significantly (P≤0.05) higher body weight than 80 and 50 g concentrate fed groups (Bhatt *et al.* 2005). In growing angora rabbits, the higher concentrate feeding was reported good for growth as compared to restricted feeding (Singh *et al.* 2004).

There was no first treatment difference in the wool yield in rabbits during first, second, third, fourth, and fifth shearings between different groups (Table 1). However, the wool yield in T₁ was higher than T₂, which was higher than T₃ during all the 5 shearings. When the wool yield of all the shearings was added together to calculate the annual yield the differences between groups widened and as a result the differences in annual yield were statistically significant (P≤0.05). The wool yield during second shearing was less in all the treatments, which also correlated well with the reduced body weight of group during this period. This is due to the summer stress due to higher temperature during this period. Seasonal influences have been recorded to be significant for wool production in angora rabbits. Winter harvests are reported to be more productive than spring which were higher than summer (Charlet-Lery *et al.* 1985). Similar results were reported by Bhatt *et al.* (1999) in Angora rabbits. Annual wool yield of rabbits in T₁, T₂ and T₃ groups was 803.0 g, 772.4 g and 767.4 g, respectively. The wool yield in T₁ group was significantly (P≤0.05) higher than T₂ and T₃ groups. Wool yield in T₂ and T₃ groups was almost similar indicating that at 110 g and 80 g of concentrate supplementation there was no effect on wool yield. Bhatt *et al.* (2005) reported non-significant differences in weight gain in broiler rabbits at 80 g and *ad lib.* (113.3±11.3 g) concentrate level and significant differences (P≤0.05) at 50 and 80 g of concentrate level. In agreement to our observations, Singh *et al.* (2004) reported significant effect of concentrate level on wool yield at 2nd shearing in angora weaners. Among wool attributes staple length in T₁ group was significantly (P≤0.05) higher than T₂ and T₃ groups. The differences between T₂ and T₃ were nonsignificant which correlated well with the wool yields in these respective groups. From these findings it is revealed that higher nutrients in the form of concentrate stimulated the staple length, which increased the wool yield in the respective group.

The non-significant differences were observed in the roughage intake in different groups indicating that different amount of concentrates did not affect the roughage intake.

Similar results were reported by Bhatt *et al.* (2005) in broiler weaners. Significant ($P \leq 0.05$) differences were observed in total dry matter intake of rabbits in different groups with highest value (157.5 g) in T_1 , followed by (133.1 g) T_2 and T_3 (115.1 g) group. The notable difference in total dry matter intake in different groups is due to the variable levels of concentrates offered in different groups. Daily crude protein provided was 31.2, 25.8 and 20.8 g in T_1 , T_2 and T_3 , respectively. In T_1 and T_2 it is well within the daily requirement i.e. 25–26 g/day as reported by Shemin *et al.* (1991) while in T_3 it is deficient.

Digestibility coefficient data revealed nonsignificant differences for dry matter, crude protein, nitrogen-free extract, acid detergent fibre and cellulose digestibility (Table 2). Significant differences exist for crude fibre and ether extract digestibility. Crude fibre digestibility was highest (44.0%) in T_3 group, followed by T_2 (39.7%) and T_1 (25.1%) group. Xiccato and Cinetto (1988) also reported low fibre digestibility at high nutritive level and vice-versa. In agreement to these observations, Bhatt *et al.* (2005) also reported increased fibre and ether extract digestibility with low concentrate level as compared to *ad lib.* concentrate fed group. Low crude fibre digestibility at high concentrate feeding is due to the fact that rabbits derive most of their energy from non-fibre carbohydrates and the fibre portion is passed unutilized from the gastro intestinal tract. The EE digestibility was 68.9% in T_1 which was significantly ($P \leq 0.05$) increased to 85.6% in T_2 and 85.4% in T_3 group. The digestibility of EE is related to the digestibility of CF in

Table 2. Digestibility of nutrients, nitrogen balance and dry matter intake in different treatments

Parameters	T_1	T_2	T_3	Standard Error
<i>Digestibility coefficient (%)</i>				
DM	64.8 ^a	69.8 ^b	66.4 ^{ab}	1.5
CP	73.6	78.3	77.1	1.5
CF	25.1 ^a	39.7 ^b	44.0 ^b	4.4
EE	68.9 ^a	85.6 ^b	85.4 ^b	3.2
NFE	73.1	75.0	70.2	1.3
ADF	39.0	40.8	43.5	1.7
Cellulose	45.0	46.3	50.7	2.7
<i>Balance of nitrogen</i>				
Daily intake (g)	5.03 ^a	4.13 ^b	3.42 ^c	0.10
Daily outgo				
Through feces (g)	1.32 ^a	0.89 ^b	0.78 ^c	0.05
Through urine (g)	2.19	2.31	2.24	0.22
Balance (g)	1.52 ^a	0.92 ^b	0.59 ^c	0.12
Balance (% of intake)	30.7 ^a	22.0 ^b	14.3 ^c	1.86
<i>Dry matter consumed/100 g wool produced</i>				
Concentrate	5.51	4.61	3.43	
Roughage	1.84	1.85	2.19	
Total	7.35	6.46	5.62	

Values with different superscripts in a row differ significantly ($P \leq 0.05$).

the diet and is due to the fact that the major part of the plant lipid is always associated with cell walls in non-added fat diets (Xiccato and Cinetto 1998). Significant ($P \leq 0.05$) differences were observed for the nitrogen balance in different groups. The daily nitrogen balance was 1.52 g in T_1 , which decreased to 0.92 g in T_2 and 0.59 g in T_3 . Similar values were reported by Singh *et al.* (1985) and Lall *et al.* (1984) for angora rabbits fed pellets plus roughage and different protein levels respectively.

Calculated dry matter used for producing 100 g wool was 7.35 kg in T_1 , 6.46 kg in T_2 and 5.62 kg in T_3 group with the respective concentrate intake of 5.51 kg in T_3 , 4.61 kg in T_2 and 3.43 kg in T_1 group indicating the T_3 group as most economical. But higher mortality in this group is most important factor to be considered before drawing any conclusion. In agreement to our observations Scholaut and Lange (1983) reported lower wool yield (188 g) and feed/kg of wool produced (60.9 kg feed) in rationed rabbit as compared to (203 g wool and 80.9 kg feed) *ad lib.* fed rabbits. In another experiment Scholaut and Lange (1983) reported 79% wool production in 80 g concentrate+ *ad lib.* roughage as compared to *ad lib.* concentrate+ roughage feeding regime. He further documented that exclusive feeding of pelleted concentrates risks a shortening of the lifespan due to the development of hair balls in the stomach, adiposis and dysentery. Therefore from this experiment it is concluded that due to almost similar wool production and mortality in groups fed 110 and 140 g concentrate/day and also fulfilling the daily protein requirement, feeding of 110 g of concentrate was adequate in adult rabbit for economical Angora rabbit production.

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