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GROWTH PERFORMANCE, SLAUGHTER AND CARCASS COMPOSITIONAL TRAITS IN RABBITS OF A LOCAL STRAIN AND NEW ZEALAND WHITE BREED RAISED IN BURUNDI

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ABSTRACT : A total of 77 males rabbits represented the Local rabbits (L) of Burundi and the New Zealand White (NZW) breed were used to evaluate the genetic differences among the two genotypes in live performance, slaughter and carcass compositional traits and to show the possibility of integrating the Local rabbits with the NZW breed in the Burundian rabbit industry for meat production. The rabbits were slaughtered at an average age of 12 weeks. Results showed that from 3 to 12 weeks of age the NZW breed produced significantly heavier animals and grew significantly faster than those of the Local strain at all ages considered in the study (1948 vs 982 g at 12 weeks). Local rabbits had higher proportions of non carcass components (except for pelt), bone in the carcass and carcass side weight occurring in fore limb, loin and hind limb and lower dressing percentage (44,7% *vs* 46,8%) and carcass lean to bone ratio and less lean in the carcass (80,4% *vs* 86,6%), and lower proportion of abdominal wall in the carcass than those of NZW rabbits. Results showed also the better distribution of carcass lean weight over the side cuts and the lower degree of carcass leanness of the Local rabbits compared to the NZW rabbits. It seems more beneficial for the rabbit producers in Burundi to use the NZW breed in a crossbreeding program with the Local strain for rabbit meat production.

RESUME : Performances de croissance, d'abattage et composition des carcasses chez de lapins de race locale et de race Néo-Zélandais Blanc, élevés au Burundi.
Trente lapins mâles de race Néo-Zélandais Blanc (NZB) et 47 de race locale (RL) du Burundi ont été utilisés pour évaluer les différences génétiques concernant la vitesse de croissance et les caractéristiques des carcasses des deux génotypes. L'objectif était d'évaluer les possibilités d'utilisation les lapins de races locale et de lapins NZB pour la production de lapin de chair au Burundi. Les 77 lapins ont été abattus à un âge moyen de 12 semaines. Les résultats montrent que de 3 à 12 semaines la race NZB produit des lapins plus lourds (1948 *vs* 982 g à 12 semaines) et qui croissent significativement plus vite que ceux de la race locale (27,4 *vs* 13,3 g/jour). Chez les lapins de race locale, les fractions corporelles non incluses dans la carcasse (excepté pour la peau), la proportion d'os dans la carcasse et les fractions de la carcasse constituées par les pattes avant, le râble et les pattes arrières sont proportionnellement plus importantes. Par contre, le rendement à l'abattage (44,7% *vs* 46,8%) et le rapport viande/os de la carcasse sont plus faibles chez les lapins locaux que chez les NZB, de même que la proportion de la masse musculaire (tissus mous) de la carcasse (80,4% *vs* 86,6%), ainsi que proportion de paroi ventrale et de cage thoracique. Les résultats montrent aussi une meilleure répartition de la viande sur la carcasse découpée des lapins de race locale. L'utilisation d'un croisement des lapins de race locale avec des sujets de race NZB semble la solution la plus profitable pour produire des lapins de chair au Burundi.

INTRODUCTION

Prolificacy, good meat-to-bone ratio, high quality and nutritive value of meat and good ability to use fibrous feeds (RAO *et al.*, 1977 ; REDDY *et al.*, 1977 ; SCHLOLAUT, 1981 ; LEBAS, 1983) make rabbits a suitable source of animal protein in developing countries. However, evaluation of the performance of rabbit breeds is of practical value to breeders in determining their productivity potential as well as in estimating the profitability of the meat production operations. Also, a knowledge of the carcass composition is essential, as it will help in recommending a particular breed to the rabbit producers.

The Burundian rabbit industry has shown interest in using some exotic rabbit breeds, such as the New Zealand White and the Californian, for increasing rabbit meat production rather than the use of the indigenous Local strain, kept mainly by farmers. On the other hand, very little is known about the productivity potential of the Local rabbits of Burundi, not submitted at the present to selection programs, and to which extend this breed can be use in the Burundian rabbit industry.

The first purpose of this study was to evaluate the genetic differences between the local rabbit strain of Burundi an the NZW breed, including rabbit growth performance, slaughter and carcass compositional traits. The second purpose was to determine the meat productivity potential of the Local breed and the possibility of its use in the Burundian rabbit industry.

MATERIAL AND METHODS

Material

The data used in this study were collected over about 1-year period, from March 1995 to February 1996, on 77 male rabbits maintained by the High Institute for Agriculture (I.S.A.) located at the city of Gitega (situated at the southern-middle region ; 1680 m over the sea), Burundi. It consisted of 47 males of the Local strains (L) and 30 males of the New Zealand White (NZW) breed, randomly sampled from progeny of 8 sires of L breed an 4 sires of NZW breed. Local rabbits are of small size and adult males and females weight about 1.7 kg. The color varies from black to white with considerable variation occurs. They are mainly reared for meat.

Management

Kits were identified at 3 weeks from birth and weaned at 6 weeks of age. After weaning, rabbits were fed *ad libitum* on a 16 % crude protein commercial pelleted ration and roughages were also available.

Traits considered

Animals weights were recorded in grams at 3, 4, 6, 8, 10 and 12 weeks of age. Daily gains (g/d) from 3 to 4, 4 to 6, 6 to 8, 8 to 10, 10 to 12 and 3 to 12 weeks of age were calculated. Daily gains were also calculated during preweaning (from 3 to 6 weeks of age) and postweaning (from 6 to 12 weeks of age -marketing age). Rabbits were slaughtered at 12 weeks of age after being fasted, for 12 hours, and weighed (slaughter weight). The weights in grams of the hot carcass (without head, giblets, testes, kidneys and kidney fat) and the following non carcass components were recorded : pelt, head (without ears), ears, testes, alimentary tract (empty and clean), liver, lungs, heart and kidneys. Then, non carcass components were expressed as percentages relative to slaughter weight. Dressing percentage (hot carcass weight/slaughter weight*100) was also calculated. Carcasses were chilled at 4°C for 24 hours and weighed (cold carcass weight). Cold right sides were separated , weighed (cold side weight) and jointed (BLASCO *et al.*, 1992) into 5 cuts, viz. fore legs, thoracic cage, loin, abdominal wall and hind legs. In the present study abdominal wall was separated from loin and considered as independent cut. Cuts were weighed and expressed as percentages of cold side weight. They were then dissected into lean (muscle°+ fat), bone and "other tissues". The weights of both lean and bone in each cut were recorded and the weights of total side lean (sum of lean of all cuts) and bone (sum of bone of all cuts) were then calculated. Weights of lean and bone in each cut were expressed as percentages of total side lean and total side bone, respectively. Also, both total side lean and bone were expressed as percentages of cold side weight. Finally, lean to bone ratios for the whole side and also for each one of side cuts (except the abdominal wall) were calculated.

Statistical analysis

The Student's "t" test was used (SNEDECOR and COCHRAN, 1967) to detect significant differences between means of the two genotypes for each one of the traits considered.

Table 1: Means, standard deviation (S.D.) and significance of differences between both means and variances for growth performance and slaughter traits of non carcass components percentages.

Traits \ Breeds	Local		New Zealand White		Significance of differences #	
	Means	S.D.	Means	S.D.	Between means	Between variances
Body weight (g) at :						
3 weeks of age	146.5^{b}	31.4	222.5^{a}	11.4	***	***
4 weeks of age	289.7^{b}	62.2	476.7^{a}	28.0	***	***
6 weeks of age	534.6^{b}	76.6	947.2^{a}	72.7	***	NS
8 weeks of age	717.5^{b}	76.7	1321.8^{a}	86.9	***	NS
10 weeks of age	855.9^{b}	72.5	1655.0^{a}	100.0	***	*
12 weeks of age	981.6^{b}	62.9	1947.5^{a}	100.1	***	**
Daily gain (g/d) between :						
3 and 4 weeks of age	20.5^{b}	6.2	36.3^{a}	2.6	***	***
4 and 6 weeks of age	17.5^{b}	3.2	33.6^{a}	3.7	***	NS
6 and 8 weeks of age	13.1^{b}	2.5	26.7^{a}	3.8	***	**
8 and 10 weeks of age	9.9^{b}	1.5	23.8^{a}	2.5	***	**
10 and 12 weeks of age	9.0^{b}	1.5	20.9^{a}	2.4	***	**
3 and 6 weeks of age	18.5^{b}	3.1	34.5^{a}	3.1	***	NS
6 and 12 weeks of age	10.6^{b}	0.9	25.4^{a}	5.3	***	***
3 and 12 weeks of age	13.3^{b}	0.9	27.4	1.4	***	**
Non carcass components (%)						
Pelt	10.0^{b}	1.1	10.8^{a}	0.6	***	**
Head (without ears)	8.3^{a}	0.5	5.3^{b}	0.4	***	*
Ears	2.5^{a}	0.2	2.2^{b}	0.2	***	NS
Testes	1.7^{a}	0.2	0.9^{b}	0.1	***	*
Alimentary tract (empty)	12.2^{a}	0.8	11.8^{b}	0.7	*	NS
Liver	4.5^{a}	0.3	4.3^{b}	0.3	**	NS
Lungs	1.4^{a}	0.1	0.7^{b}	0.1	***	NS
Heart	1.7^{a}	0.1	0.8^{b}	0.1	***	*
Kidneys	1.2^{a}	0.1	0.6^{b}	0.1	***	NS
Slaughter traits :						
Slaughter weight (g)	1045.7^{b}	68.5	2056.3^{a}	105.0	***	***
Hot carcass weight (g)	458.8^{b}	45.9	842.8^{a}	84.3	***	***
Dressing percentage	44.7^{b}	1.8	46.8^{a}	2.8	***	**

° Means within each row bearing different superscript differ significantly. # NS : not significant at P>0.05 ;
* : significant at P<0.05 ; ** : significant at P<0.01 ; *** : significant at P<0.001

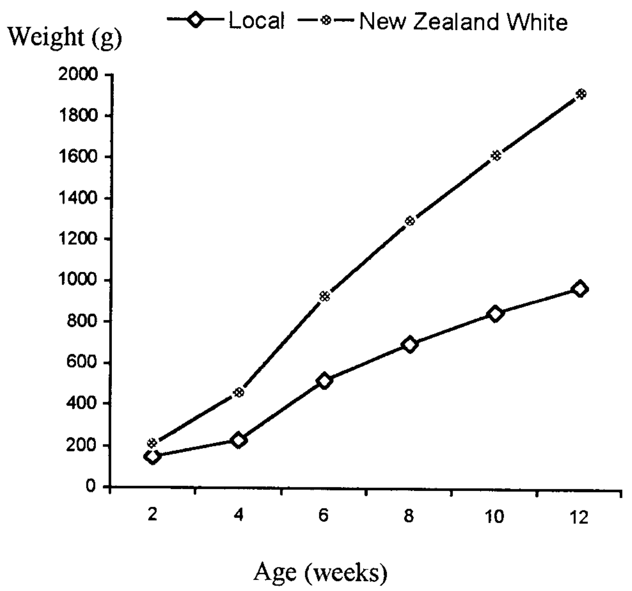

Figure 1 : Live weight evolution

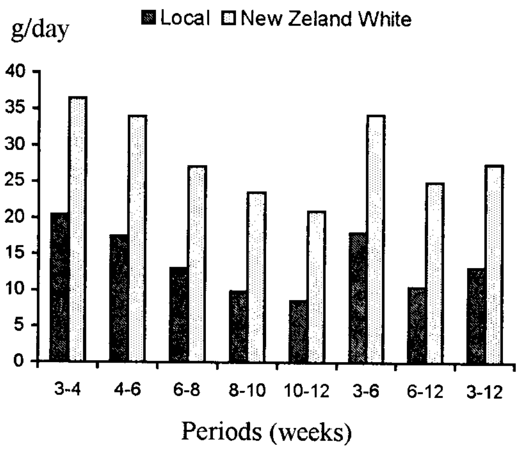

Figure 2 : Average daily gain

Because animals come from two populations of different types, we might expect that the variances will not be the same. Therefore, the distribution of "F" was used, before using the test of "t", to test the null hypotheses that $\sigma_1 = \sigma_2$ (i.e. the equality of variance). The test criterions is $F = s_1/s_2$ where s_1 is the larger mean square.

RESULTS AND DISCUSSION

Growth performance

Means, standard deviations and significance of differences between genotype means and also between variances for live performance traits are summarized in table 1. The difference between the means is strongly significant whether the variances are assumed the same or not. Results showed that New Zealand White rabbits (NZW) were highly significantly heavier than those of Local rabbits (L) at all ages considered in the study. NZW rabbits increased gradually their weights from about 1.5 times at 3 weeks of age to about2.0 times at marketing age (12 weeks) than those of L rabbits. This may reflect a higher feed conversion ratio for NZW rabbits compared to L rabbits. Figure 1 represents growth curve for the two genotypes. It seems that the two genotypes have the same shape of growth curve especially at the earlier ages. Following birth until marketing, the NZW rabbits grew highly significantly faster (from about 1.8 times to about 2.4 times) than L rabbits. This high rate of gain which characterize the NZW breed (fig. 2) is more important from weaning to marketing (about 2.4 times more) than from 3 weeks of age to weaning (about 1.9 times more). Generally, large rabbit breeds gained significantly faster to the similar finish endpoint than small breeds (LEBAS *et al.*, 1986). This high rate of gain makes the NZW rabbits more suitable for producing meat than L rabbits. Doe effect are considered to be the most important factors affecting body weight at birth and up to weaning and they are still present at later ages (KHALIL *et al.*, 1986). FERRAZ *et al* 92) reported that maternal or litter influences in rabbits may be more important than additive genetic effects for postweaning growth as well as for carcass traits.

Non carcass components

Table 1 also presents means, standard deviations and significance of differences between genotype means and also between variances for percentages of non carcass components. The breed differences in slaughter weight ($P<0.001$) were reflected mean differences in both hot carcass weight and dressing percentage ($P<0.001$) and also in the proportions of all non carcass components considered in the study. The L rabbits had higher proportions of non carcass components except pelt than those of the NZW rabbits. These results reflected differences in both hot carcass weight and dressing percentage in the favor of NZW rabbits. GEBRIEL *et al.* (1989) reported significant differences between the Giant Flander and Bouscat breeds in weights of hot carcass, skin and head and also in dressing percentage due to differences in body weight at marketing. In our study, the above mentioned factor explains the observed differences between the two genotypes in the proportions of non carcass components.

Carcass compositional traits

Table 2 summarizes means, standard deviations and significance of differences between genotype means and also between variances for proportion of carcass components. In most cases the difference between the means is strongly significant whether the variances are assumed the same or not. Breeds differed significantly in the proportions of main tissues of the carcass and in the proportions of carcass cuts and also in carcass leanness traits expressed by lean to bone ratio of the carcass and of different cuts. Carcasses of Local strains had about 6% less lean and about 6% more bone than those of NZW breed. Carcasses of L breed, compared with those of NZW breed, showed lower lean to bone ratio (4.3 *vs* 6.6). They showed also lower proportion of carcass weight occurring in abdominal wall cut and higher proportion of carcass weight occurring in fore limbs, loin and hind limbs cuts. The two genotypes had similar proportion of carcass weight occurring in thoracic cage cut.

Distribution of lean weight over side cuts was significantly different between genotypes (table 2). The

Table 1: Means, standard deviation (S.D.) and significance of differences between both means and variances for carcass components percentages.

Traits \ Breeds	Local		New Zealand White		Significance of differences #	
	Means	S.D.	Means	S.D.	Between means	Between variances
Dressed side weight (g)	228.0[b]	21.5	425.8[a]	50.5	***	***
Side lean percentage	80.4[b]	2.2	86.6[a]	1.1	***	***
Side bone percentage	19.0[a]	2.1	13.2[b]	1.0	***	***
Side lean to bone ratio (g/g)	4.3[b]	0.5	6.6[a]	0.6	***	NS
Cuts as percentage of side weight						
Hind limb	40.0[a]	2.1	36.1[b]	2.2	***	NS
Loin	17.1[a]	1.9	16.2[b]	1.0	*	***
Abdominal wall	6.9[b]	0.7	12.2[a]	0.6	***	NS
Thoracic cage	20.3	1.2	205	0.9	NS	NS
Fore limb	15.7[a]	0.9	14.9[b]	1.2	***	NS
Cut lean as percentage of side lean						
Hind limb	41.3[a]	2.4	35.8[b]	4.8	***	***
Loin	16.7[a]	2.0	15.7[b]	1.1	**	***
Abdominal wall	8.6[b]	0.9	14.2[a]	0.7	***	NS
Thoracic cage	18.6[b]	1.2	19.4[a]	1.1	**	NS
Fore limb	15.2[a]	1.1	14.2[b]	1.3	***	NS
Cut bone as percentage of side bone						
Hind limb	35.3[a]	2.8	34.1[b]	2.0	*	*
Loin	18.9	3.3	19.3	1.1	NS	***
Thoracic cage	27.5	2.9	27.6	1.6	NS	**
Fore limb	17.6[b]	2.8	21.1[a]	9.2	*	***
Lean to bone ratio (g/g) in						
Hind limb	5.0[b]	0.7	7.1[a]	0.5	***	NS
Loin	3.8[b]	0.5	5.4[a]	0.8	***	*
Thoracic cage	2.9[b]	0.5	4.6[a]	0.4	***	NS
Fore limb	3.8[b]	0.6	4.8[a]	0.6	***	NS

° Means within each row bearing different superscript differ significantly. # Ns : not significant at P>0.05 ;
* : significant at P<0.05 ; ** : significant at P<0.01 ; *** : significant at P<0.001

biggest observed difference was both hind limbs (41.3 *vs* 35.8%) and abdominal wall (8.6 *vs* 14.2%) cuts. Advantageous lean weight distribution seems to exit in L breed as compared with NZW breed.

Breed appeared to have no big influence (table 2) on the distribution of carcass bone weight between various carcass cuts other than limbs an lower proportion in the fore limbs. However, genotypes did not differ significantly (P>0.05) in the distribution of carcass bone between the loin and thoracic cage cuts.

The difference in both lean weights among the two genotypes especially lean weight reflected differences in lean to bone ratios of the different carcass cuts (table 2). Advantageous degree of carcass leanness occurring in different carcass cuts especially in the hind limbs and thoracic cage seems to exist in NZW rabbits as compared with L rabbits.

Our results agree with the conclusion of OUHAYOUN (1980) who found significant differences among three breeds of rabbits in carcass composition and muscle to bone ration of the hind legs due to the existing differences in mature body weight. However, in two line of the NZW breed, ORAVCOVA and BEBER (1991) observed significant differences only in the weights of fore legs and back cuts and also in weight of edible meat of the fore legs.

CONCLUSION

The results showed the superiority of the NZW rabbits in both growth rate and grams of weights produced per animal until marketing. They had also better degree of carcass leanness. However, the L rabbits showed better distribution of carcass weight occurring in the different carcass cuts.

In developing countries the quantity of meat produced per animal is more important than the quality of carcass or its meat. Therefore, it seems more beneficial for the rabbit procedures in Burundi to use NZW in a crossbreeding program with the L breed for rabbit meat production.

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