PROCEEDINGS OF THE 11th WORLD RABBIT CONGRESS
Qingdao (China) - June 15-18, 2016
ISSN 2308-1910

Session
Management & Economy

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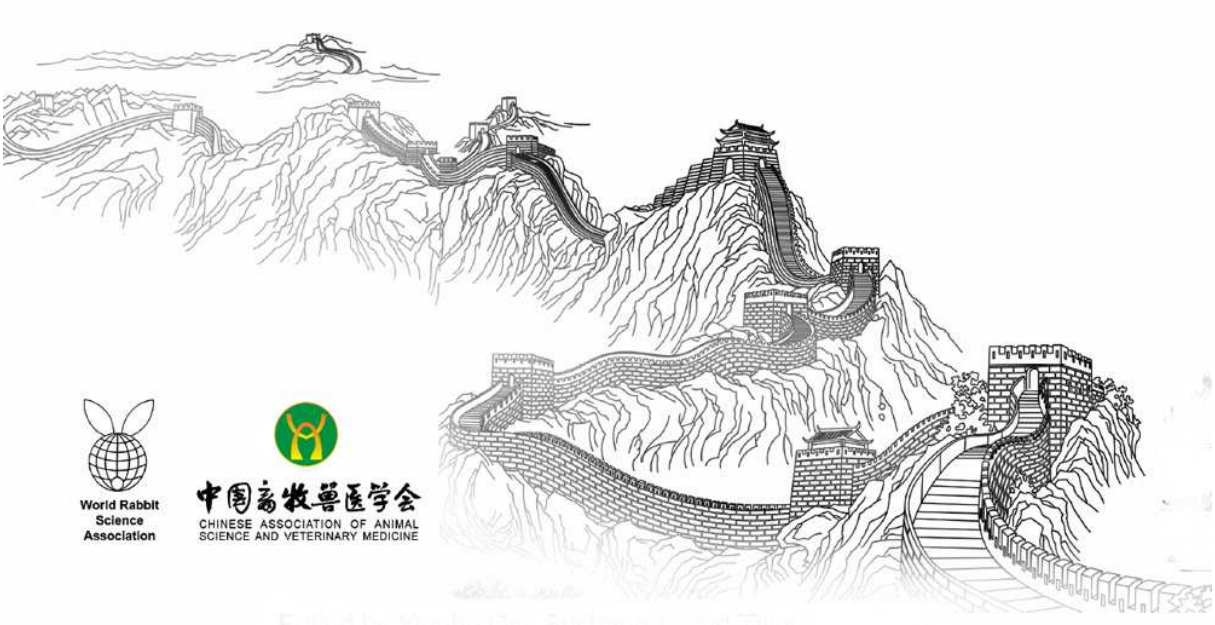
How to cite this paper :
Mahunguane S.J.S., Ambula M.K., Bebe B.O., 2016 - Effects of weaning age on carcass quality of rabbits reared on smallholder farms in Kenya. *Proceedings 11th World Rabbit Congress - June 15-18, 2016 - Qingdao - China, 977-980. + Poster.*



EFFECTS OF WEANING AGE ON CARCASS QUALITY OF RABBITS REARED ON SMALLHOLDER FARMS IN KENYA

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ABSTRACT

This study used thirty six rabbits in a 2x2x3 factorial arrangement of a completely randomized design (CRD) to assess the effects of weaning age (4 or 8 weeks), diet (commercial pellets or mixed diets) and breed (New Zealand White, Californian White or Chinchilla) on carcass quality of rabbits reared by smallholder farmers in Kenya. Rabbits slaughtered at six months had their live-weight influenced by the interaction effects of weaning, diet and the breed ($p<0.05$). Dressing percentage was higher for rabbits fed on commercial pellets than those fed on mixed diet ($p<0.05$) but was not sensitive to weaning age. However, weaning age had significant effect on weights of first and second retail cuts. Compared to other breeds, Californian white weaned at 4 weeks and those fed on commercial pellets had heavier ($p<0.05$) loin (0.686 kg) and hind leg (0.433kg). The thoracic cage weight varied with ($p<0.05$) weaning age and diets. Therefore we conclude that under smallholder rabbit farms rearing conditions weaning age has effects on carcass quality measured as weight of dressed out carcass or weight of retails cuts.

Key words: Carcass quality, Smallholder systems, Rabbit breeds.

INTRODUCTION

Over half (53%) of smallholder farmers in Kenya keep rabbits to earn some income while over a third (37%) keep rabbits for home consumption and only a few (10%) value rabbits as pets (Mailu, Wanyoike, Serem, & Gachuiri, 2014). Commercial orientation in rabbit production has to be supported with rewarding remunerations to producers.

There are indications that management practices on smallholder farms may not be remuneratively rewarding because the average number of litters/doe/year attained is between 4 and 5, far below performance attained in commercial rabbit production which attain over 7 litters/doe/year (Lukefahr & Cheeke, 1990). Few litters will have low off take and may be associated with long kindling interval in the range of 4 to 12 weeks period of parturition to mating (Borter & Mwanza, 2010). Rabbit flocks with prolonged interval between parturition and mating will have a delayed weaning age, which may be explained by diet quality and choice of breed.

This study therefore assessed the effect of weaning age, diet and breed on carcass quality of rabbits reared on smallholder farms in Kenya.

MATERIALS AND METHODS

Animals and experimental design

Thirty six live rabbits were purchased from different smallholder farmers registered with the Rabbit Breeders Association of Kenya (RABAK) in two Counties (Kiambu and Nakuru), where commercial

smallholder rabbit production is concentrated in Kenya. Farmers were selected through stratified random sampling procedure designed to account for heterogeneity in management practices (weaning age, feeding and breed) from which rabbits were purchased for the study. On the farms, sampling targeted two weaning ages (4 and 8 weeks), two feeding diets (commercial pellets supplemented with *Chloris gayana* hay or mixed diet of commercial pellets and forages (dry or fresh, mainly : *Panicum maximum, Bidens pilosa, Galinsoga parviflora, Pennisetum purpureum,* maize grain, sweet potato vines, cabbage waste, kikuyu grass, carrots,) and three breeds (New Zealand White, Californian White and Chinchilla). This conformed to a completely randomized design (CRD) with a 2 x 2 x 3 factorial arrangement in which each rabbit constituted an experimental unit.

Measuring carcass quality

After purchase, rabbits were fasted for 10 hours before slaughtering, with free access to fresh and clean water. Slaughtering and dressing methods followed normal commercial procedures (Cavani and Petracci, 2004). Live weight was recorded before slaughtering and hot carcass weight chilled at +4^{o}C for 24 hours (Blasco and Ouhayoun, 1993). The dressing out percentage and weights of first retail cuts (loin and hind legs) and second retail cuts (thoracic cage) were computed from hot carcass weight.

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Statistical analysis

Carcass quality was assessed on basis of live weight, dressing percentage, loin, thoracic cage and hind legs. The statistical model fitted the effects of main factors (weaning age, diet and breed) and their two and three way interaction effects on the carcass quality indicators:

$$Y_{ijkl} = \mu + W_i + F_j + B_k + (WF)_{ij} + (WB)_{ik} + (FB)_{jk} + (WFB)_{ijk} + \varepsilon_{ijkl}$$

with μ: overall mean; W_i: effect of weaning age; F_j: effect of feeding diet; B_k: effect of breed; WF: interaction between weaning age and feeding; WB: interaction between weaning age and breed; FB: interaction between feeding diets and breed; WFB: interaction between the three factors. An analysis of variance in general linear model procedure (SAS, 2009) was adopted and the probability differences between groups tested using Tukey's test where the effect were significant (P<0.05).

RESULTS AND DISCUSSION

Table 1 presents the least square means for the carcass quality measures and the main factors and interaction effects. The model explained a large proportion of variance in carcass weight (46 to 87%) while the main effects of weaning age, diet and breed showed significant effect on most of the carcass quality measures (Figures 1, 2 and 3). The three way interaction was significant for live weight (LW) and hot hind legs weight (HHLW) only while the two interactions were insignificant for chilled weights for hot thoracic cage weight (HTCW) and chilled thoracic cage weight (CTCW).

Live weight was influenced by the interactive effect of weaning age, diets and the breed (P<0.004) and interaction between breed and weaning age (P<0.001). Weaning age and diets (P<0.036) had effect on hot carcass weight. The dressing percentage was only influenced by diets (P<0.004). The interaction effects of breed and weaning age had significant effects (P<0.001) on loin for both hot and chilled weight.

Interaction between weaning age, breed and diet had effect on hot hind legs weight (P<0.045) while chilled hind legs are influenced by weaning age and breed (P<0.0001). Hot thoracic cage weight is influenced by weaning age (P<0.004) and feeding (P<0.0001), and chilled weight was influenced by diet (P<0.001).

Table 1: Least-squares means for carcass and retail cuts weight of rabbits from different weaning ages, breed and feeding diets

			Carcass traits								
Feeding diets	Weaning age	Breeds	LW (kg)	HCW (kg)	DoP (%)	HLW (g)	CLW (g)	HHLW (g)	CHLW (g)	HTCW (g)	CTCW (g)
Mixed	4 w	NZW	2.0^{bc}	1.0^{b}	49.1^{a}	394^{b}	392^{b}	281^{b}	280^{b}	181^{a}	180^{a}
		Cal	2.3^{b}	1.3^{b}	50.9^{a}	439^{b}	435^{b}	308^{b}	308^{b}	160^{a}	158^{a}
		CH	1.9^{bc}	0.9^{b}	47.3^{a}	317^{b}	267^{b}	260^{b}	230^{b}	150^{a}	137^{b}
	8 w	NZW	1.6^{c}	0.83^{b}	49.9^{a}	329^{b}	328^{b}	218^{b}	218^{b}	142^{b}	142^{b}
		Cal	1.9^{bc}	0.9^{b}	50.3^{a}	359^{b}	353^{b}	230^{b}	230^{b}	146^{b}	144^{b}
		CH	1.9^{bc}	0.9^{b}	49.5^{a}	337^{b}	310^{b}	260^{b}	253^{b}	133^{b}	123^{b}
Pelletsl + hay	4 w	NZW	2.8^{a}	1.5^{a}	53.0^{a}	640^{a}	635^{a}	396^{a}	395^{a}	211^{a}	209^{a}
		Cal	2.9^{a}	1.67^{a}	56.9^{a}	686^{a}	682^{a}	433^{a}	433^{a}	218^{a}	215^{a}
		CH	2.3^{b}	1.26^{b}	54.6^{a}	440^{b}	380^{b}	300^{b}	290^{b}	207^{a}	193^{a}
	8 w	NZW	1.9^{bc}	0.9^{b}	49.5^{a}	335^{b}	333^{b}	273^{b}	271^{b}	152^{a}	151^{a}
		Cal	2.3^{b}	1.2^{b}	53.8^{a}	451^{b}	447^{b}	332^{a}	331^{a}	182^{a}	181^{a}
		CH	2.7^{a}	1.4^{a}	51.5^{a}	493^{a}	447^{b}	390^{a}	353^{a}	217^{a}	203^{a}
	MSE		±0.19	±0.14	±3.53	±69.8	±64.8	±36.1	±31.8	±23. 5	±31.7
	Significance		***	S	NS	NS	NS	*	S	NS	NS

HCW=hot carcass weight; DoP= dressing out percentage, DoP=HCW/Live weight*100; HLW=hot loin weight; CLW=chilled loin weight; HHLW=hot hind legs weight; CHLW=chilled hind legs weight; HTCW=hot thoracic cage weight; CTCW=chilled thoracic cage weight;
NS=non-significant; S=significant (0.05<*P*<0.1); **P*<0.05; ***P*<0.001; ^{a,b,c} means within same column with different superscript differ statistically (*P<0.05)*.

Weaning early (4 weeks) and feeding commercial pellets increased the live weight for Californian and Chinchilla breeds, hot carcass weight was higher in Chinchilla and New Zealand White weaned at 4 weeks and fed commercial pellets supplemented with Rhodes grass hay (*Chloris gayana).* Similar results were obtained by Zita *et al.* (2007); Xiccato *et al. (* 2000, 2004). Weaning age had no effect on dressing out percentage instead it was high in rabbits fed commercial pellets with hay supplementation without breed effect (Bianospino et al., 2006). In this study dressing out percentage might have been influenced by other factors related to management not considered in the fitted model giving $R^2 = 0.455$.

The first retail cuts were high in Californian and New Zealand white weaned at 4 weeks and fed commercial pellets supplemented with Rhodes grass hay (*Chloris gayana*) 686 g, 640g and 433g 396g for hot loins and hind legs respectively. These results are different to the findings of (Bianospino et al., 2006) which loin ranged from 295.5 to 308.7 grams and hind parts from 401.4 to 412 in straightbred and crossbred respectively, yet second retail cut (thoracic cage), yielded less on rabbits weaned at 8 weeks and fed mixed diet for all the three breeds.

CONCLUSION

These results demonstrate that under smallholder rabbit rearing conditions, weaning age, diet and breed have interaction effects on carcass quality measured as killing out percentage or weight of retails cuts. Weaning California white and New Zealand white rabbit breeds at 4 weeks of age on commercial pellets produce heavier and better quality carcass for both first retail cuts (loin and hind legs) and the second retail cuts (thoracic cage). Chinchilla rabbit breed weaned at 8 weeks on commercial pellets produce

heavier and better quality carcass for both first retail cuts (loin and hind legs) and the second retail cuts (thoracic cage).

ACKNOWLEDGEMENTS

Research supported by NICHE/MOZ/150-ISPG project (Nuffic), the authors wish to thank the Rabbit Breeders Association of Kenya (RABAK) in particular Mr. Waiganjo and Mr. Peter Kagi, and Nakuru
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1 THE MESSAGE

In commercial rabbit production, weaning at 4 weeks or 8 weeks of age produce heavier and better quality carcass if rabbits are fed commercial pellets.

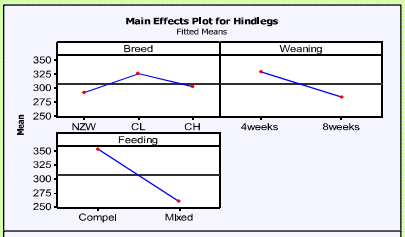
2 INTRODUCTION

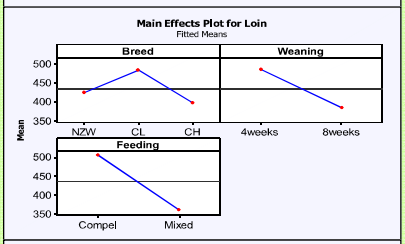
In Kenya over half (53%) of smallholders keep rabbit for commercial gain, but management practices do not target remunerative rewards. The kindling interval is long, giving between 4 and 5 litters/doe/year. Can change in weaning age reward farmers better in carcass quality?

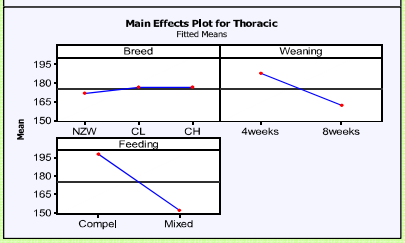
3 METHODS

- Thirty six live rabbits from smallholder farmers registered with the Rabbit Breeders Association of Kenya (RABAK) were randomly selected in conformity with 2 x 2 x 3 factors factorial arrangement in a completely randomized design (CRD) .
- Sample farms selected represented two weaning ages (4 and 8 weeks), two feeding diets (commercial pellets or mixed diet of pellets and forages) and three breeds (New Zealand white, Californian white and Chinchilla).
- Slaughter and dressing methods fallowed normal commercial procedures. Dressing out percentage and weights of first retail cuts (loin and hind legs) and second retail cuts (thoracic cage) were computed from hot carcass weight chilled at +4°C for 24 hours.

4 RESULTS







Least-squares means for carcass and retail cuts weight of rabbits for different weaning ages, breeds and feeding diets. In smallholder farms in Kenya

Feeding diets	Weaning age	Breeds	Carcass traits								
			LW (kg)	HCW (kg)	DoP (%)	HLW (g)	CLW (g)	HHLW (g)	CHLW (g)	HTCW (g)	CTCW (g)
Mixed	4	NZW	2.0^{bc}	1.0^{b}	49.1^{a}	394^{b}	392^{b}	281^{b}	280^{b}	181^{a}	180^{a}
		CL	2.3^{b}	1.3^{b}	50.9^{a}	439^{b}	435^{b}	308^{b}	308^{b}	160^{a}	158^{a}
		CH	1.9^{bc}	0.9^{b}	47.3^{a}	317^{b}	267^{b}	260^{b}	230^{b}	150^{a}	137^{b}
	8	NZW	1.6^{c}	0.83^{b}	49.9^{a}	329^{b}	328^{b}	218^{b}	218^{b}	142^{b}	142^{b}
		CL	1.9^{bc}	0.9^{b}	50.3^{a}	359^{b}	353^{b}	230^{b}	230^{b}	146^{b}	144^{b}
		CH	1.9^{bc}	0.9^{b}	49.5^{a}	337^{b}	310^{b}	260^{b}	253^{b}	133^{b}	123^{b}
Compel	4	NZW	2.8^{a}	1.5^{a}	53.0^{a}	640^{a}	635^{a}	396^{a}	395^{a}	211^{a}	209^{a}
		CL	2.9^{a}	1.67^{a}	56.9^{a}	686^{a}	682^{a}	433^{a}	433^{a}	218^{a}	215^{a}
		CH	2.3^{b}	1.26^{b}	54.6^{a}	440^{b}	380^{b}	300^{b}	290^{b}	207^{a}	193^{a}
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		CL	2.3^{b}	1.2^{b}	53.8^{a}	451^{b}	447^{b}	332^{a}	331^{a}	182^{a}	181^{a}
		CH	2.7^{a}	1.4^{a}	51.5^{a}	493^{a}	447^{b}	390^{a}	353^{a}	217^{a}	203^{a}
MSE			0.19	0.14	3.53	69.8	64.8	36.1	31.8	23.5	31.7
Significance			***	*	NS	NS	NS	*	*	NS	NS

HCW=hot carcass weight; DoP= dressing out percentage, DoP=HCW/Live weight*100; HLW=hot loin weight; CLW=chilled loin weight; HHLW=hot hind legs weight; CHLW=chilled hind legs weight; HTCW=hot thoracic cage weight; CTCW=chilled thoracic cage weight;

NS=non-significant; *P<0.05; ***P<0.001;

5 CONCLUSIONS

Weaning California white and New Zealand white rabbit breeds at 4 weeks of age on commercial pellets produce heavier and better quality carcass for both first retail cuts (loin and hind legs) and the second retail cuts (thoracic cage). Chinchilla rabbit breed weaned at 8 weeks on commercial pellets produce heavier and better quality carcass for both first retail cuts (loin and hind legs) and the second retail cuts (thoracic cage).

ACKNOWLEDGEMENT

Research funded by NUFFIC project NICHE/MOZ/150-ISPG. The authors wish to thank the Rabbit Breeders Association of Kenya (RABAK) and Nakuru Rabbit Meat Center for their precious assistance during data collection process reported in this communication.