THE GENETIC AND NON-GENETIC AFFECT ON CARCASS CHARACTERISTICS OF NEW ZEALAND WHITE AND BALADI BLACK RABBITS

التأثير الوراثي وغير الوراثي على خصائص الذبيحة في أرانب النيوزيلندي الأبيض والبلدي الأسود

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Doi: 10.21608/asajs.2021.179614

استلام البحث: ٢٩ / ٥ /٢٠٢١ قبول النشر: ٢٢ / ٦ / ٢٠٢١

El-Deighadi , Amira S.; Gharib , M. G.; seif EL-Nasr, M.I; Yonan, G. E. Salem, Mogda M. & Mawla ,Lamia F. Abdel (2021). ***Arab Journal of Agriculture Sciences***, AIESA.(4),11, pp 141 - 162.

ABSTRACT:

Data collected on 120random male at 12 weeks of age, from New Zealand white and Baladi Black rabbit. Data were analyzed applying multi-trait animal model ofcarcass characteristicsto obtain proportion of the phenotypic variance due to additive genetic effects (h^2);common litter effects (c^2); random error effects (e^2); genetic (r_G), common litter (r_C), environmental (r_E) and phenotypic (r_P) correlations.Datawere carried out by weighed least-squares means method in the procedure GLM of statistical software SAS(2003) to obtain least squares of effects for breed, parity and season and significant. Heritability estimateswere mostly moderate 0.20, 0.12 and 0.37 for live weight at slaughter, weight after bleedingand weight with viscera and without head,were moderate and high and ranged from 0.29 to 54 for edible parts, were moderate and ranged from 0.30 to 0.35 for dressing yield, alsowere low and moderate and ranged from 0.03 to 0.33 for inedible parts.Common litter effects Estimates were 0.37, 0.55 and 0.55 for live weight at slaughter, weight after bleedingand weight with viscera and without head, were ranged from 0.28 to 0.60 for edible parts, were estimates ranged from 0.38 to 0.42for dressing yield and ranged from 0.42 to 0.55 inedible parts.All possible genetic correlations betweencarcasscharacteristics were moderate to highandpositive except among TEDand both of LU and FUR, also between DR1 and VIS were negative.Common litter correlationsamongrecords ofcarcasscharacteristicswere mostly moderate or high, positiveand negative.Correlations ofenvironmental betweencarcasscharacteristicswere mostly moderate or high, positive and negative. Estimates of (r_P)between records of different carcasscharacteristicswere mainly positive and moderate or high magnitude. No significant differences of breed on carcass characteristics except for giblet. New Zealand White had highest of giblet and leaver. In mostly

parity affected significantly on carcass characteristics, the highest value during first parity except for giblet and leaver were highest value during second parity. Contrary other traits were insignificantly.Most carcass characteristics were higher in winter months than other seasons.

Key words: Edible parts, dressing yield %, inedible parts, heritability, genetic and phenotypic correlations.

المستخلص :

تم تحليل البيانات باستخدام برنامج النموذج الحيواني بطريقة معظمة الاحتمال المعتمدة على حساب المشتقات التفاضلية DFREML لخصائص الذبيحة لتقدير المكافىء الوراثى و التأثيرالمشترك لخلفة البطن و تأثير الخطأ التجريبى و تقديرالارتباط الوراثي والمشترك لخلفة البطن و البيئى والظاهرى.تم استخدام البرنامج الإحصائي (SAS 2003) للحصول على المربعات الصغرى لتأثير السلالة والبطن والموسم والمعنوية.بوجه عام كانت فيم المكافىء الوراثى متوسطة وكانت ٠,٢٠- ٠,١٢ و ٠,٣٧ للوزن الحى عند الذبح وبعد الذبح وبالاحشاء وبدون الرأس. وكانت قيمته متوسطة وعالية وتتروح بين ٠,٢٩– ٠,٥٤ للأجزاء الصالحة للأكل. وكانت متوسطة وتتروح بين ٠,٣٠ – ٠,٣٥ لنسب التصافى. وايضا كانت منخفضة ومتوسطة و تروحت بين ٠,٠٣ – ٠,٣٣ بالنسبة للأجزاء غير الصالحة للأكل. وكانت قيم التأثيرالمشترك لخلفة البطن ٠,٣٧ و ٠,٥٥و٠,٥٥ للوزن الحى عند الذبح وبعد الذبح وبالاحشاء وبدون الرأس . وتتروح بين ٠,٣٨ -٠,٤٢ لنسب التصافى .وتتروح بين ٠,٤٢- ٠,٥٥ للأجزاء الصالحة للأكل. جميع الارتباطات الوراثية الممكنة بين خصائص الذبيحة كانت متوسطة وعالية وموجبة ماعدا بين كلا من الأجزاء الصالحة للأكل و الفرو والرئة. وايضا نسبة التصافى١ و الاحشاء. والارتباط المشترك لخلفة البطن بين خصائص الذبيحة كانت متوسطة وعالية وموجبة وسالبة. كانت قيم الارتباط البيئى لخصائص الذبيحة كانت متوسطة وعالية وموجبة وسالبة. الارتباط الظاهرى بين خصائص الذبيحة المختلفة كان موجب ومتوسط وعالى. لا توجد فروق معنوية لتأثير السلالة على خصائص الذبيحة بإستثناء giblet وكانت سلالة النيوزيلندى الأبيض أعلى لقيم giblet والكبد. كان تأثير البطن بوجه عام معنوى على خصائص الذبيحة وكانت أعلى قيم خلال البطن الأولى ما عدا giblet والكبد كانت أعلى خلال البطن الثانية عن باقى الصفات الأخرى. كانت معظم خصائص الذبيحة أعلى فى الشتاء عن المواسم الأخرى.

التوصية: من القيم المتوسطة او العالية للمكافيء الوراثى فانه يمكن تحسين خصائص الذبيحةمن خلال الأنتخاب للحيوانات. كان التأثير المشترك لخلفة البطن واضحا وله تأثيرات قوية على خصائص الذبيحة.كانت قيم الارتباط الوراثي والمشترك لخلفة البطن و البيئى لخصائص الذبيحة متوسط وموجب وعالى فإن الأنتخاب لأحدى الصفات سيؤدى الى التحسين فى الأخرى.لا توجد فروق معنوية لتأثير السلالة على خصائص الذبيحة.كان تأثير البطن بوجه عام معنوى على خصائص الذبيحة.كانت معظم خصائص الذبيحة أعلى فى الشتاء عن المواسم الأخرى.

INTRODUCTION:

Production of rabbit has an important role in bridging shortage of food in many countries Khalil et al.,(2016). For meat ofRabbit has several advantages including high protein content and low cholesterol content Hanaa et al.,(2014). The quality attributes of food products including rabbit meat have been attracting an increasing interest in recent years. Meat products from ecological rearing were characterized by a higher nutritive quality and better taste Horsted et al.,(2010).In addition rabbit has a quite high dressing percentage when compared to ruminants, ranging between 50 - 65% (Lebas et al., 1986andRoiron et al., 1992). Heritability of different carcass traits is medium to high, and therefore carcass traits might be considered in rabbit selection and breeding, however it has been reported that different factors, such as age at slaughter, weight at slaughter, breed, and sex, have an influence on different carcass traits (ParigiBini et al., 1992; Bianospino et al., 2006; Gašperlin et al., 2006and Metzgeret al., 2006). The purpose of this study is to estimate of heritability, common litter effects, and genetic, common litter, environmental and phenotypic using multi-trait animal to determine the suitability of selection for achieving genetic improvement.Also discuss some non-genetic that affect carcass characteristicsfor New Zealand white and Baladi Black rabbits. Hence, an effort was made to find the effects of different

factors on the carcass characteristicsfor obtaining maximum dressed meat and dressing yield.

MATERIALS AND METHODS:

Animals and data:

This study was carried out at Sakha Animal Farm, Animal Production Research Institute, Agricultural Research Center, Dokki, Egypt (APRI). Data collected on 120random maleat 12 weeks of age, from New Zealand white and Baladi Black rabbit.

Slaughtering procedure:

All rabbits were weighed and slaughtered. Each rabbit was bled and weighed to determine the blood weight. Fur was removed and weighed after slaughter. Head was separated and the internal organs were also removed and weighed.Furwith tail and feet and other inedible parts were also measured with a sensitive scale. Data collection as followed; Pre-slaughter weight(g) was the live weight of each rabbit before slaughter in grammars; Hot carcass (g) was the weight after slaughter and bleeding of rabbit; Giblets(g) were total weight of kidney, liver and heart; Inedible carcass(g) were total weight of lung, furwith tail and feet,viscera, blood, ;Edible carcass(g, dressed head and giblet. Dressing yield (%)was taken as the percentage of edible carcass to the pre-slaughter weight.

The statistical analysis:

The variances and covariances were obtained using REML method of VARCOMP procedure of SAS 2003. Data were analyzed applying multi-trait animal model of carcass characteristics applying MTDFREML programs of Boldman*et al.*,1995, to obtain

Starting mixed model was obtained applying REML method of VARCOMP procedure of SAS 2003. Data were analyzed using multi-trait animal model of carcass characteristicsusing MTDFREML programs of Boldman *et al.*,1995, to obtain

proportion of the phenotypic variance due to additive genetic effects (h^2);common litter effects (c^2); random error effects (e^2); genetic (r_G), common litter (r_C), environmental (r_E) and phenotypic (r_P) correlations. Analyses were done according to the general model:

$$\mathbf{y = Xb + Z_1a + Z_2p + e.} \quad \textbf{(Model 1)}$$

Where, y=Vector of observation, X= Incidence matrix of fixed effects; b = vector of fixed effects including breed, (NZW and BB), parity (3 levels) and season (4 levels); $Z_1$and Z_2= incidence matrices corresponding to random effects of additive (a) and common litter effect (r_C)respectively.

Datawere carried out by weighed least-squares means method in the procedure GLM of statistical software SAS(2003) to obtain least squares and used to compare means by Duncan's multiple range test for carcass characteristics.

$$\mathbf{Y_{ijk} = \mu + B_i + P_j + S_k + e_{ijk}.} \quad \textbf{(Model2).}$$

Where:

Y_{ijk} = the parameters on the ijkth carcass characteristics, μ = the overall mean, B_i = the fixed effect of the ith breeds (i= NZW and BB); P_j = the fixed effect of the jth parity (j=1, 2 and 3);S_k = the fixed effect of the kth season (k=1,2, 3 and 4)and e_{ijk} = the random deviation of all the other effects no specified the model.

III. Results and Discussion:

Genetic affect:

Heritability estimates

Heritability estimates for carcass characteristics in (Table 1). The estimateswere mostly moderate 0.20, 0.12 and 0.37 for live weight at slaughter, weight after bleedingand weight with viscera and without head. The estimates were moderate and high and ranged from 0.29 to 54 for edible parts. The estimates were moderate and ranged from 0.30 to 0.35 for dressing yield. The estimates were low and moderate and ranged from 0.03 to 0.33 for inedible parts. Ayyat *et al.*, (1994) with NZW rabbits,

Heritability were low to moderatefor non-edible carcass traits. Ferraz and Eler, (1996) found moderate estimates of heritability for carcass weight andcarcass yield of 0.178 and 0.152 for the Californian breed and 0.152 and 0.000 for NZW rabbits, respectively. Khalil et al., (2005) reported heritability estimates for hot carcass weight, offal weight and meat weight were moderate and ranged 0.10 to 0.16 but low for dressing percent (0.097). Al Seaf et al., (2007) reported heritability estimates for edible and non-edible carcasswere mostly moderateand ranged from 0.12 to 0.22.Garreau et al., (2008) reported that heritability estimates for carcass yield were moderate (0.24).

Table 1: Estimates for proportion of the phenotypic variance due to additive genetic effects (h^2) and to common litter effects (c^2) and to random error effects (e^2) with standard errors (±SE) for carcass characteristicsfor New Zealand white (NZW) and Baladi Black (BB) rabbits.

Arameters	**h^2**	**c^2**	**e^2**
Live weight, at slaughter, g	0.20 ± 0.03	0.37 ± 0.06	0.43 ± 0.09
Weight after bleeding, g	0.12 ± 0.02	0.55 ± 0.07	0.33 ± 0.05
Weight with viscera and without head, g	0.37 ± 0.06	0.54 ± 0.08	0.08 ± 0.1
Edible parts:			
Hot carcass without head, g	0.29 ± 0.11	0.60 ± 0.09	0.11 ± 0.02
Giblet, g	0.41 ± 0.06	0.52 ± 0.08	0.07 ± 0.14
Head, g	0.38 ± 0.10	0.53 ± 0.08	0.11 ± 0.02
Total edible, g	0.54 ±0.07	0.28 ± 0.04	0.17 ± 0.03
Dressing yield %:			
Carcass %	0.31 ± 0.11	0.42 ± 0.06	0.27 ± 0.04
Carcass with giblet %	0.30 ± 0.11	0.39 ± 0.06	0.30 ± 0.05
Carcass with giblet and head %	0.35 ± 0.10	0.38 ± 0.06	0.28 ± 0.04
Inedible parts:			
Lung, g	0.16 ± 0.03	0.47 ± 0.08	0.37 ± 0.06
Fur, g	0.33 ± 0.05	0.42± 0.02	0.25 ± 0.12
Viscera, g	0.06 ± 0.15	0.55 ± 0.09	0.39 ± 0.06
Blood, g	0.03 ± 0.01	0.48 ± 0.08	0.49 ± 0.08
Total inedible	0.11 ± 0.14	0.45 ± 0.07	0.44 ± 0.07
Inedible : edible	0.19 ± 0.03	0.50 ± 0.08	0.32 ± 0.11

From these observations for moderate or high for hertabilities, it is genetic point of view improvements were achieved in carcass traits through selection of animals.

Common litter effects

Common litter effects for carcass characteristics in (Table 1)were moderate to high and were generally higher than the respective heritabilities. Estimates were 0.37, 0.55 and 0.55 for live weight at slaughter, weight after bleeding and weight with

viscera and without head. The estimates ranged from 0.28 to 0.60 for edible parts. The estimates ranged from 0.38 to 0.42for dressing yield. The estimates ranged from 0.42 to 0.55 inedible parts. These results agreement with Al Seaf et al., (2007) who reported common litter effects for carcass traits and ranged from 0.31 to 0.37 for slaughter and edible carcass traits, 0.29 to 0.39 for non-edible carcass traits and suggested common litter effects appeared to have strong effects on growth even up to slaughtering time. Ferraz*et al.*,(1992) found that common environmental effects to be consistently more important than direct genetic effects for several traits studied, but Lukefahr*et al.*, (1996) reported that for each carcass trait investigated, the magnitudes of variance components for direct genetic and common environmental effects were similar.

Correlations among carcass characteristics:

Importance of economic and biological relationships betweenstudying traits may understood in relationship to other traits. The estimates of genetic (r_G), common litter (r_C), environmental (r_E) and phenotypic (r_P) correlations are shown in Tables 2, 3, 4 and 5.

Genetic correlations (r_G)

Generally all possible genetic correlations between carcass characteristics were moderate to highandpositive except among TEDand both of LUand FUR, also between DR1 and VIS were negative (Table 2). The higher correlations between LWBand both of WB; DR1; LU and IND: TED,also higher among WB and both of WBV; DR1; DR2, also higher among HC and TE, also higher among G and both of TE; VIS, also higher among H and both of DR1; BL.also higher among TED and both of B1; TIND; also higher among DR1; DR2; DR3; BL; TIND, also higher among DR2and both of DR3; FUR; TIND; IND:TEDand higher between TIND and IND: TED.From results

selection improving LWB might be expected to improvement in all pervious traits**.**Su et al., (1999) found that a negative genetic correlation between post-weaning daily gain and dressing yield (-0.22). Garreau et al., (2008) reported that the negative genetic correlation between 63-day body weight and dressing yield (-0.24). Hanaa et al., (2014) reported that the genetic correlation between **sl**aughter weight and weaning weight were high and positive (0.73).

Table 2: Estimates genetic correlations (r_G) for carcass characteristics for (NZW) and (BB) rabbits.

	WB	**WBV**	**HC**	**G**	**H**	**TED**	**DR1**	**DR2**	**DR3**	**LU**	**FUR**	**VIS**	**BL**	**TIND**	**TIND:TED**
LWB	0.96	0.56	0.59	0.57	0.49	0.19	0.98	0.54	0.53	086	0.57	0.49	0.04	0.78	0.97
WB		0.86	0.76	0.58	0.44	0.53	0.88	0.81	0.62	0.59	0.51	0.68	0.62	0.14	0.78
WBV			0.60	0.51	0.79	0.81	0.54	0.40	0.50	0.32	0.36	0.64	0.31	0.93	0.42
HC				0.29	0.34	0.99	0.62	0.50	0.50	0.58	0.68	0.64	0.42	0.54	0.46
G					0.91	0.98	0.45	0.61	0.54	0.76	0.36	0.91	0.72	0.39	0.57
H						0.47	0.85	0.28	0.21	0.47	0.33	0.60	0.85	0.65	0.64
TED							0.20	0.33	0.26	-0.73	-0.63	0.66	0.82	0.88	0.74
DR1								0.99	0.99	0.57	0.17	-0.29	0.89	0.66	0.80
DR2									0.99	0.77	0.98	0.82	0.93	0.99	0.99
DR3										0.91	0.88	0.94	0.87	0.46	0.81
LU											0.67	0.57	0.43	0.79	0.77
FUR												0.82	0.78	0.71	0.15
VIS													0.73	0.85	0.87
BL														0.61	0.70
TIND															0.97

LWB=Live weight, at slaughter, g; WB=Weight after bleeding, g; WBV=Weight with viscera and without head, g; HC=Hot carcass without head, g; G=Giblet, g; H=Head, g; TED= Total edible, g; DR1= Carcass %; DR2= Carcass with giblet %; DR3= Carcass with giblet and head %; LU= Lung, g; VIS= Viscera, g; B=Blood; TIND= Total inedible; IND:TED= Inedible : edible.

Common litter correlations (r_C)

The estimates of common litter correlationsamongrecords ofcarcasscharacteristics mostly moderate or high, positive and negative (Table 3). The higher correlations amongLWB and both ofand both of WBV; HC; H; TED ; DR2; DR3 and IND: TED, also higher among WB and both of WBV; FUR and TIND, also

higher among HC and TE, also higher among G and both of H TED, also higher among DR1and both of DR2; DR3; LU; BL.also higher among DR2and both of B1; TIND; also higher among DR1; DR2; DR3; BL; TIND, also higher among DR2 and both of DR3; FUR; VIS TIND, higher amongDR3 and both ofLU; FUR; VIS, higher between LU and VIS and higher between TIND and IND: TED. From resultsthe importance ofcommon litter correlationoncarcasscharacteristics becomes evident.Thus, it is necessary might recommend that these correlations should be considered in any program of breeding to improve litter traits in rabbits.No research is available for estimates of(r_C) carcass characteristics in rabbits.

Table 3: Estimates common litter correlations (r_C) for carcass characteristics for (NZW) and (BB) rabbits.

	WB	WBV	HC	G	H	TED	DR1	DR2	DR3	LU	FUR	VIS	BL	TIND	TIND:TED
LWB	0.72	0.92	0.93	0.66	0.94	0.98	0.41	0.98	0.80	0.60	0.64	0.49	0.61	0.76	0.96
WB		0.97	0.50	0.53	0.70	0.79	-0.89	-0.56	0.63	0.50	0.92	0.68	-0.11	0.82	0.17
WBV			0.67	0.28	0.27	0.73	-0.99	-0.98	-0.97	0.54	0.43	0.62	0.55	0.58	0.19
HC				0.17	0.22	0.98	0.58	0.60	0.51	0.31	-0.57	-0.96	0.13	-0.78	-0.90
G					0.93	0.97	-0.89	-0.96	-0.71	-0.98	0.34	-0.13	-0.72	0.20	-0.37
H						0.98	-0.97	-0.98	-0.84	-0.18	0.38	0.21	-0.13	0.25	-0.45
TED							0.76	0.54	0.56	0.63	0.76	0.41	-0.97	0.74	0.67
DR1								0.98	0.99	0.94	-0.98	-0.89	0.98	0.77	0.48
DR2									0.98	0.50	0.80	0.90	-0.34	0.99	-0.99
DR3										0.91	0.91	0.88	-0.50	0.42	0.35
LU											0.75	0.81	0.77	0.11	0.78
FUR												0.29	-0.17	0.43	0.77
VIS													0.49	0.92	0.88
BL														0.67	0.13
TIND															0.96

+ Trait as defined in Table 2.

Environmental correlations (r_E)

All possible correlations of environmental correlations between carcass characteristics mostly moderate or high, positiveand negative (Table 4).Falconer and Mackay (1989)they reported some cases, estimates of r ($_G$) and r ($_E$)are different in magnitude, or even in sign, while in other cases the two types of correlations are of the same sign and do not differ in magnitude,and a large difference, and particularly a difference in sign, showed that genetic and environmental sources of variation

affect the characters through different physiological mechanismand this is most common mode of my study.No research is available for estimates of(r_E) carcass characteristics in rabbits.

Table 4: Estimates environmental correlations (r_E)for carcass characteristics for (NZW) and (BB) rabbits.

	WB	WBV	HC	G	H	TED	DR1	DR2	DR3	LU	FUR	VIS	BL	TIND	TIND:TED
LWB	0.96	0.91	0.38	0.70	0.46	0.82	-0.68	0.17	0.88	0.04	0.72	0.73	-0.19	0.79	-0.49
WB		0.77	0.59	0.42	0.71	0.68	-0.01	-0.97	-0.94	0.28	0.37	0.53	0.61	0.85	0.66
WBV			0.64	0.44	0.80	0.55	0.78	0.53	0.31	0.33	0.40	0.91	0.76	0.98	0.44
HC				0.63	0.58	0.88	0.53	0.50	0.50	0.18	0.91	0.45	0.32	0.54	0.99
G					0.69	0.94	0.54	0.95	0.97	0.99	0.85	0.58	0.75	0.61	0.34
H						0.61	0.23	0.83	0.92	0.83	0.25	0.35	0.55	0.55	0.55
TED							0.64	0.64	0.65	0.71	0.41	-0.78	0.90	0.63	0.82
DR1								0.99	0.99	0.12	-0.06	-0.24	0.98	0.19	0.82
DR2									0.98	-0.61	0.80	0.99	-0.97	0.98	0.98
DR3										0.96	0.91	0.88	-0.50	0.42	0.35
LU											0.75	0.81	0.77	0.11	0.44
FUR												0.74	0.48	0.83	0.64
VIS													0.67	0.90	0.91
BL														0.18	0.61
TIND															0.61

+ Trait as defined in Table 2.

Phenotypic correlations (r_P)

Estimates of (r_P)between records of different carcasscharacteristicswere mainly positive and moderate or high magnitude(Table 5).Hanaa et al., (2014) reported thatdaily weight gain from weaning to slaughter was phenotypically high positive correlated with slaughter weight with value of 0.68.

However, positive (r_P)among any two traits of carcasscharacteristicsdo not necessarily indicate that selecting on one of these trait will lead to an improvement in the other, because a phenotypic correlation is not always a reliable estimate of the genetic relationship existing between traits, for example, environmental effect on two traits could be strong and positively correlated that a negative genetic correlation is masked.Therefore, it is recognized that phenotype association is not a satisfactory guide to the expectedcorrelated genetic response of traits under selection;only geneticcorrelation should be used for such a prediction.In practice, high or moderate and positive estimates of the phenotypic correlation in currentstudies

and review among carcasscharacteristics give considerable advantage for rabbit breeders in their management and culling decisions.

Table 5: Estimates phenotypic correlations (r_P) for carcass characteristics for (NZW) and (BB) rabbits.

	WB	WBV	HC	G	H	TED	DR1	DR2	DR3	LU	FUR	VIS	BL	TIND	TIND:TED
LWB	0.83	0.74	0.66	0.57	0.65	0.11	0.37	0.73	0.40	0.62	0.58	0.58	0.18	0.77	0.72
WB		0.58	0.52	0.48	0.42	0.61	-0.26	-0.64	0.65	0.41	0.60	0.61	0.28	0.77	0.42
WBV			0.64	0.49	0.50	0.72	-0.24	-0.33	-0.32	0.43	0.39	0.63	0.42	0.67	0.26
HC				0.25	0.31	0.97	0.57	0.51	0.48	0.33	0.08	-0.38	0.15	0.18	0.11
G					0.91	0.98	-0.17	-0.08	0.03	0.02	0.40	0.17	-0.15	0.29	0.19
H						0.55	-0.12	-0.20	-0.14	0.20	0.33	0.27	0.15	0.37	0.15
TED							0.48	0.46	0.43	0.19	0.08	0.09	0.08	0.62	0.67
DR1								0.98	0.98	0.38	-0.46	-0.80	0.84	0.52	0.65
DR2									0.95	0.99	-0.15	0.70	-0.15	0.95	0.97
DR3										-0.13	0.85	0.98	-0.13	0.49	0.31
LU											0.27	0.61	0.23	0.44	0.51
FUR												0.47	0.17	0.74	0.56
VIS													0.56	0.89	0.85
BL														0.42	0.34
TIND															0.86

+ Trait as defined in Table 2

Non-genetic affect:

Breed effect

Least square means of the carcass characteristics of New Zealand White (NZW) and Baladi Black (BB) were presented on Table 6 shows that in generally there were no significant differences of breed on carcass characteristics except for giblet. New Zealand White had highest of giblet and leaver. Ghosh et al. (2004) reported that no significant differences among breeds in body weight at maturity. Ouyed and Brun (2008) found that there were no significant effects of breed type on commercial carcass weight, commercial carcass yield of New Zealand White and Californian breed and their crosses. Ghosh and Mandel (2008) reported that the effects of breed on the values of hot carcass, giblet, dressed head and total edible were non-significant. Baiomy and Hassanien (2011) observed that though breed differences had no significant effect on most carcass traits, dressing yield of carcass was significantly higher in New Zealand white than Californian breed(58.5, 57.3%), respectively. While Das and Bardoloi (2008) they reported that breed had

highly significantly (P < 0.01) effects on carcass weight of rabbits and inedible offal and breed did not have a significant effect on edible organs. However Fadare (2015) reported that the New Zealand white had the highest dressing yield percentage of 67.95±1.95 while Palomino brown had the least dressing yield (55.23±2.36%). California and Havana black breed had similar dressing yield.

Table 6. Least-squares means and standard errors of carcass characteristics as affected by breed for New Zealand white (NZW) and Baladi Black (BB) rabbits.

Parameters	**NZW**	**BB**
Live weight, at slaughter, g	1970.4 ± 33.5	1956.5 ± 33.5
Weight after bleeding, g	1926.1 ± 33.7	1910.6 ± 33.7
Weight with viscera and without head, g	1461.6 ± 18.9	1024.8 ± 18.9
Edible parts:		
Hot carcass without head, g	1013.5 ± 18.9	1024.8 ± 18.9
Giblet, g	107.1 ± 2.9[a]	88.6 ± 2.9[b]
Head, g	115.8 ± 2.1	119.4 ± 2.1
Total edible, g	1236.4 ± 20.5	1232.9 ± 20.5
Dressing yield %:		
Carcass %	51.9 ± 0.90	52.5 ± 0.90
Carcass with giblet %	57.3 ± 0.91	57.1 ± 0.91
with giblet and head %	58.9 ± 0.92	59.7 ± 0.92
Inedible parts:		
Lung, g	12. 2 ± 0.41	13.3 ± 0.41
Fur, g	348.5 ± 11.6	321.1 ± 11.6
Viscera, g	452.0 ± 19.0	448.0 ± 19.0
Blood, g	40.6 ± 2 .3	41.9 ± 2.3
Total inedible	853.2 ± 27.6	824.2 ± 27.6
Inedible : edible	69.1 ± 2.3	68.0 ± 2.3

Parity effect:

In mostly parity affected significantly (P≤0.01) (LBW, SBW, SBWV, SBWN, hot carcass, giblet, total edible, kidney and leaver), the highest value during first parity except for giblet

and leaver were highest value during second parity. Contrary other traits were insignificantly (Table 7). Whereas Prayaga and Eady (2003). They obtained significantly higher carcass weight in 2nd and 3rd parity litters than in 1st and 4th ones.Ouyed and Brun (2008) reported that there was no significant effect of parity on carcass traits.

Table 7. Least-squares means and standard errors of carcass characteristics as affected by parity for (NZW) and (BB) rabbits.

Parameters	**1st**	**2 nd**	**3 rd**
Live weight, at slaughter, g	2011.3 ± 60.8^{a}	1981.2 ± 60.8^{ab}	1936.3 ± 47.1^{b}
Weight after bleeding, g	1975.8 ± 61.2^{a}	1926.9 ± 61.2^{ab}	1893.1 ± 47.4^{b}
Weight with viscera and without head, g	1541.6 ± 46.3^{a}	$1444.0 \pm 46.3a^{b}$	1437.6 ± 35.9^{b}
Edible parts:			
Hot carcass without head, g	1071.3 ± 36.1^{a}	989.1 ± 36.7^{b}	988.3 ± 27.9^{b}
Giblet, g	91.3 ± 4.7^{a}	109.4 ± 4.7^{ab}	105.3 ± 3.6^{b}
Head, g	114.1 ± 3.8	122.6 ± 3.8	115.6 ± 3.0
Total edible, g	1276.6 ± 39.0^{a}	1221.1 ± 39.0^{b}	1209.2 ± 30.2^{b}
Dressing yield %:			
Carcass %	53.4 ± 1.6	50.5 ± 1.6	51.3 ± 1.3
Carcass with giblet %	57.9 ± 1.7	56.0 ± 1.7	56.8 ± 1.3
Carcass with giblet and head %	60.0 ± 1.7	57.8 ± 1.7	58.4 ± 1.3
Inedible parts:			
Lung, g	14.2 ± 0.98	11.4 ± 0.78	12.3 ± 0.60
Fur, g	317.2 ± 34.3	375.8 ± 21.3	330.4 ± 16.5
Viscera, g	473.0 ± 34.3	467.7 ± 34.3	432.0 ± 26.6
Blood, g	45.4 ± 4.6	38.1 ± 4.6	41.1 ± 3.5
Total inedible	843.1 ± 48.5	886.3 ± 48.5	835.6 ± 37.5
Inedible : edible	68.4 ± 4.2	71.3 ± 4.2	69.2 ± 3.3

Season effect:

In generally the effect of season on carcass characteristics in (Table 8)was higher significantly ($P \leq 0.01$). Most carcass characteristics were higher in winter months than other seasons, may be attributed to suitability of the environmental conditions to rabbit production, increase in food consumption and abundance of

green fodders during winter months and summer is more stressful due to extreme heat and relative humidity. Farghaly and El-Mahdy (1999), they reported that season appears to be the major non genetic factor affect live body weight and carcass traits. The highest live body weight and carcass traits were estimated during winter. Antonella (2000) reported that the involved mostly the environmental and the season in which temperature play a major role on productive and slaughtering performance. As occurs for livestock, even for rabbits, the increase of environmental temperature over the thermo neutrality value reduces the feed intake and consequently, growth rate resulting in lower slaughter weight, at commerciality slaughter age, and sometimes, better slaughter yield because of the lower proportion of skin, empty cut and offal's.

Table 8. Least-squares means and standard errors of carcass characteristics as affected by season for (NZW) and (BB) rabbits.

Parameters	**1st**	**2 nd**	**3 rd**	**4 th**
Live weight, at slaughter, g	2049.0 ± 79.0^{a}	1930.4 ± 79.8^{b}	1882.0 ± 48.0^{b}	1995.8 ± 48.0^{b}
Weight after bleeding, g	2046.5 ± 79.0^{a}	1898.7 ± 79.6^{b}	1833.2 ± 48.3^{b}	1949.4 ± 48.3^{b}
Weight with viscera and without head, g	1505.9 ± 46.9	1019.4 ± 46.9	1024.4 ± 28.4	1024.4 ± 28.4
Edible parts:				
Hot carcass without head, g	995.4 ± 46.9	1019.4 ± 46.9	1025.6 ± 28.4	1024.4 ± 28.4
Giblet, g	137.9 ± 6.1^{a}	91.1 ± 6.1^{b}	92.2 ± 3.7^{b}	86.8 ± 5.7^{b}
Head, g	126.0 ± 5.0^{a}	107.5 ± 5.0^{b}	114.0 ± 3.0^{b}	122.2 ± 3.0^{a}
Total edible, g	1259.2 ± 50.6^{a}	1218.0 ± 50.6^{b}	1231.9 ± 30.7^{ab}	1233.4 ± 30.7^{ab}
Dressing yield %:				
Carcass %	48.1 ± 2.1^{b}	52.7 ± 2.1^{b}	54.8 ± 1.3^{a}	51.4 ±1.3^{b}
Carcass with giblet %	54.7 ± 2.2^{b}	57.5 ± 2.2^{b}	59.8 ± 1.3^{a}	55.7 ± 1.3^{b}
Carcass with giblet and head %	55.3 ± 2.2^{b}	59.4 ± 2.2^{b}	61.9 ± 1.3^{a}	58.6 ± 1.3^{b}
Inedible parts:				
Lung, g	9.9 ± 1.0^{b}	14.6 ± 1.0^{a}	12.1 ± 0.61^{ab}	13.8 ± 0.61^{ab}
Fur, g	418.6 ± 27.6^{a}	301.7 ± 27.6^{b}	325.2 ± 16.8^{b}	319.0 ± 16.8^{b}
Viscera, g	518.2 ± 44.6^{a}	442.2 ± 44.6^{b}	395.6 ± 27.1^{b}	474.2 ± 27.1^{ab}
Blood, g	39.8 ± 6.0	45.1 ± 6.0	36.8 ± 3.6	44.4 ± 3.6
Total inedible	995.3 ± 63.0^{a}	812.4 ± 63.0^{b}	751.9 ± 38.2^{c}	860.3 ± 38.2^{b}
Inedible : edible	76.7 ± 5.5^{a}	69.2 ± 5.5^{a}	61.3 ± 3.3^{b}	71.3 ± 3.3^{a}

CONCLUSION:

From the values of the moderate or high for hertabilities, it is genetic point of view improvements were achieved in carcass traits through selection of animals.Common litter effects

appeared to have strong effects on carcass characteristics.Genetic, common litter, environmental correlations amongrecords ofcarasscharacteristics were mostly moderate or high, positiveindicate that selecting on one of these trait will lead to an improvement in the other.No significant differences of breed on carcass characteristics**.** Mostly parity affected significantly on carcass characteristics.Most carcass characteristics were higher in winter months than other seasons

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