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Carcass quality traits in four different crossbreds developed for backyard poultry and the effect of age on carcass quality under intensive system of rearing

M K PADHI[1] and R N CHATTERJEE[2]

Project Directorate on Poultry, Rajendranagar, Hyderabad, Andhra Pradesh 500 030 India

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ABSTRACT

Present study was undertaken to evaluate male birds of 4 different crossbreds chicken (PD1 × PD4 (A), PD1 × PB2 (B), PD1 × PD3 (R), PD1 × IWI (W)) for different carcass quality parameters at 10 and 18 weeks of age. At 10 and 18 weeks of age 8 and 6 birds each from each genetic group, respectively, were sacrificed to measure different carcass quality traits. Effects of age on each genetic group in respect to different carcass quality traits were also studied. All the traits on weight basis differed significantly between the genetic groups at 10 weeks of age. However, at 18 weeks of age pre slaughter body weight, shank, gizzard, giblet weight and all the cut up parts weight differed significantly. At 10 weeks of age statistical significance between different genetic groups was observed for feather, head, shank, eviscerated yield, liver, gizzard, abdominal fat and giblet%. Abdominal fat% was lowest in A. At 18 weeks of age head, shank, eviscerated and liver% differed significantly between genetic groups. Highest eviscerated% was obtained in B with lowest abdominal fat. Age effect was significant for eviscerated yield, liver, gizzard and abdominal fat in B. In R head, shank, liver, gizzard and giblet% reduced significantly at 18 weeks of age. Cut up parts percentage expressed as % of eviscerated weight showed significant difference between genetic groups for legs % at 10 weeks of age. Age showed significant effect for back and legs % in A and B, whereas R and W showed significant effect of age for neck and legs % and back and neck %, respectively. The results indicated that genetic groups and age significantly affect different carcass quality traits and B male recorded better eviscerated yield compared to other genetic groups. Legs cut % increases with increase of slaughter age.

Key words: Age effect, Backyard poultry, Carcass quality, Crossbreds, Cut up parts

Different exotic crosses are being developed for backyard poultry farming (Khan 2008). However, still there is a scope to develop more crosses for backyard poultry. The males of the exotic backyard poultry are being used for the meat purpose as the female are being reared for the egg production. Poultry meat is considered as healthy, nutritious, safe and affordable choice among the available meat sources regardless of economic status of the consumer (Bilgili 2002).The information on some of the carcass quality factors like eviscerated yield, abdominal fat, giblet and proportion of various cuts is important from consumer's point of view as well as for benefits to producers by predicting the yields and to assess the economic return. Carcass quality traits of exotic germplasm used for backyard poultry farming are available in literature (Ahmed *et al.* 2006, Mondal *et al.* 2007). Effect of age on slaughter age on performance of meat quality of slow growing broiler chickens was reported by Poltowicz and Doktor (2012). However, in the present study an effort was made to evaluate and compare carcass quality traits in 4 different crossbreds developed for backyard poultry farming under intensive system of rearing and also to see the effect of age on carcass traits in each of the cross.

MATERIALS AND METHODS

The present investigation was undertaken on 56 male birds randomly picked up from 625 straight run chicks produced in 4 different crossbreds genetic groups viz., PD1 × PD4 (A), PD1 × PB2 (B), PD1 × PD3 (R) and PD1 × IWI (W) developed for backyard poultry farming and maintained at the Project Directorate on Poultry, Hyderabad, India. The male parent used in all the four crossbreds is being developed from a low performing Cornish population (Ayyagari 2003) and used as a male line for backyard poultry. PB2, PD3 and IWI were all female lines and were developed from synthetic coloured meat type, Dhalem Red and White Leghorn, respectively. PD4 was derived from Aseel a native breed of India. The chicks were wing banded and brooded on a deep litter system, with a decreasing temperature schedule from

Present address: [1]Principal Scientist (padhi16@rediffmail.com), [2]Project Director (rnchat@rediffmail.com), Project Directorate on Poultry, Rajendranagar, Hyderabad-500 030, Andhra Pradesh

33°C during first week to 23°C at the end of fifth week in an open-sided house with curtains hanging from outside during brooding period. The curtains were removed after 6 weeks of age. Floor space was given as per the standard requirements for medium meat type birds. All the chicks were reared under intensive system to study their performance. Chicks were provided *ad lib.* broiler starter ration (2,800 kcal/kg of ME and 20% CP on calculated basis) up to 8 weeks of age. From 8 weeks on-wards grower ration (2,600 kcal/kg of ME and 16% CP on calculated basis) was provided up to 18 weeks of age. Due to lack of rearing space for growing from each genetic group 18 males were selected randomly at 8 weeks of age and kept along with female. Females were being kept for egg production study. In A, R and W the grower rations were provided *ad lib* as in all these crosses one parent was either egg type or indigenous breed. However, in B quantitative feed restriction was practised as in this cross both the parents used were meat type bird and the growth was more. This was done with the aim to get the optimum weight of female for better egg production. The chicks were vaccinated against Marek's disease, Newcastle disease, infectious bursal disease and fowl pox. At 10 weeks of age, 8 males from each genetic group were randomly picked up and sacrificed for study of carcass traits. Similarly at 18 weeks of age, 6 male birds from each genetic group were randomly picked up and sacrificed for study of carcass traits. Rest 4 males in each genetic group were kept for rearing with female. Feed was withheld for 12 h prior to slaughter, however, birds were allowed to free access to water during the period. Live weight was recorded prior to sacrificing. After cutting the jugular vein, blood was drained out and weight of blood was taken as the difference between live weight prior to slaughter and that of the bled bird. Feathers were wet picked by hand after scalding. Head was removed close to the skull and shank+feet at the hock joint. Following evisceration, the eviscerated carcass, heart, liver, gizzard and abdominal fat were weighed. Thereafter, the carcass was cut into five parts: breast, back, neck, legs and wings, and the weights were recorded. Blood loss, feather loss, head, shank+feet, eviscerated carcass yield, heart, liver, gizzard, giblet (heart+liver+gizzard) were also expressed as percent yield of pre-slaughtered live weight. Cut up parts were expressed as per cent of eviscerated carcass weight.

The data were analysed by analysis of variance (ANOVA) and student's t-test using standard procedure (Snedecor and Cochran 1989) to determine the effect of genetic groups and to see the effect of age on different traits in each genetic group.

RESULTS AND DISCUSSION

The weight and percentage of different carcass traits measured at 10 and 18 weeks of age are presented in Tables 1 and 2, respectively. Significance effect of age on different carcass traits in different genetics groups are presented in Table 3.

Carcass traits at 10 weeks: Pre-slaughtered body weight differed significantly ($P<0.05$) between genetic groups and B recorded significantly higher weight, followed by A, R and W. Higher blood loss for B group of chicken was due to higher live weight relating to genetic factors (Table 1). Blood loss expressed as per cent of live weight showed significant ($P<0.05$) effect of genetic groups. Significant ($P<0.05$) difference for blood loss weight in different crossbreds was reported by Mandal *et al.* (2007). However, blood % was lower in the present study compared to reports of Mandal *et al.* (2007) and Thutwa *et al.* (2012). This may be due to effect of different genetic make-ups of the birds. Feather loss was significant ($P<0.05$) at 10 weeks of age amongst genetic groups both on weight and % basis. Similar % was reported for feather loss in White Leghorn cockerel by Padhi *et al.* (1999a). None significant ($P<0.05$) feather loss both in weight and % basis was reported by Mandal *et al.* (2007) in different crosses and % feather loss was comparable to the present findings. Head expressed both as weight and % basis was significant at 10 weeks of age between genetic groups. The % observed in the present study was higher than the report of Mandal *et al.* (2007) in different crossbred. Shank+feet expressed both as % of live weight and on weight basis differ significantly ($P<0.05$) between genetic groups. Significant ($P<0.05$) effect of genotype on shank weight and% was reported by Thutwa *et al.* (2012). Shank % was higher in the present study compared to finding of Mandal *et al.* (2007). This may be due to use of different strains in crosses. Eviscerated carcass on weight and percent basis differ significantly ($P<0.05$) between the crosses and the highest carcass weight was observed in B. Eviscerated% was better in the present study than the reported literature (Padhi *et al.* 1997, Mandal *et al.* 2007) and comparable to some reports (Reddy *et al.* 2008, Muthukumar *et al.* 2011, Thutwa *et al.* 2012). Heart, liver, gizzard and giblet differ significantly ($P<0.05$) between genetic groups on weight basis but when expressed as % of live weight, except heart%, liver, gizzard and giblet % differ significantly ($P<0.05$) between genetic groups. Heart weight were comparable to the report of Reddy *et al.* (2008) and lower than the report of Isidahomen *et al.* (2012). Heart liver and gizzard was percentage lower than the report of Thutwa *et al.* (2012). The giblet % was comparable to the report of Poltowicz and Doiktor (2012) and lower than the report of Padhi *et al.* (1999a). Abdominal fat weight and its % differed significantly ($P<0.05$) between genetic groups. The weight and % were significantly ($P<0.05$) higher in B and lowest in W. Low abdominal fat was reported by Padhi *et al.* (1999b) in different crossbreds. Higher abdominal fat % was reported by Poltowicz and Doiktor (2012) in slow growing broiler and higher abdominal fat weight was reported by Isidahomen *et al.* (2012) in indigenous chicken than the present study.

Cut up parts expressed on weight basis were affected by genetic groups significantly ($P<0.05$) and the weight was

Table 1. Carcass quality traits weight at 10 weeks of age in different crosses

Traits	A	B	R	W
Pre-slaughter B.wt.	1382±30.29^{b}	2228±30.60^{a}	1194±59.11^{c}	1174±40.90^{c}
Blood loss				
Weight (g)	46.86±4.03^{b}	81±9.15^{a}	52.65±3.89^{b}	64.5±5.34^{b}
%	3.40±0.30^{c}	3.65±0.41^{bc}	4.44±0.29^{b}	5.47±0.35^{a}
Feather loss				
Weight (g)	78.26±9.37^{bc}	125.2±4.82^{a}	68.16±5.79^{c}	89.48±5.72^{b}
%	5.64±0.64^{b}	5.62±0.20^{b}	5.71±0.39^{b}	7.62±0.43^{a}
Head				
Weight (g)	59.33±3.09^{b}	74.55±2.57^{a}	50.74±1.89^{c}	53.58±3.73^{bc}
%	4.29±0.19^{a}	3.34±0.08^{b}	4.28±0.13^{a}	4.54±0.21^{a}
Shank				
Weight (g)	71.68±2.11^{b}	110.38±1.48^{a}	60.53±2.40^{c}	52.83±3.09^{d}
%	5.19±0.13^{a}	4.96±0.05^{ab}	5.10±0.12^{a}	4.51±0.21^{b}
Eviscerated carcass				
Weight (g)	990.25±21.99^{b}	1598.88±18.89^{a}	833.25±43.94^{c}	784.75±27.86^{c}
%	71.65±0.40^{a}	71.79±0.46^{a}	69.76±0.70^{b}	66.88±0.85^{c}
Heart				
Weight (g)	6.95±0.73^{b}	9.4±0.44^{a}	6.86±1.06^{b}	5.59±0.40^{b}
%	0.50±0.05	0.42±0.02	0.56±0.07	0.48±0.03
Liver				
Weight (g)	26.04±0.76^{bc}	41.16±1.35^{a}	24.20±1.62^{b}	27.83±1.08^{c}
%	1.88±0.06^{b}	1.85±0.05^{b}	2.02±0.06^{b}	2.37±0.08^{c}
Gizzard				
Weight (g)	31.10±1.81^{a}	56.96±4.61^{b}	31.20±1.97^{b}	35.30±1.86^{b}
%	2.25±0.12^{b}	2.55±0.19^{b}	2.61±0.08^{b}	3.01±0.14^{c}
Giblet				
Weight (g)	64.09±2.47^{b}	107.53±5.23^{a}	62.26±4.12^{b}	68.71±2.32^{b}
%	4.63±0.13^{c}	4.820±0.20^{bc}	5.20±0.13^{b}	5.87±0.14^{a}
Abdominal fat				
Weight (g)	4.93±2.50^{b}	18.61±3.60^{a}	4.50±1.95^{b}	0.60±0.60^{b}
%	0.34±0.17^{b}	0.83±0.16^{a}	0.35±0.14^{b}	0.05±0.04^{b}
Breast*				
Weight (g)	231.69±7.94^{b}	375.76±4.52^{a}	195.85±10.83^{c}	186.68±6.44^{c}
%	23.38±0.50	23.53±0.40	23.50±0.38	23.82±0.38
Back*				
Weight (g)	215.08±4.97^{b}	340.17±11.24^{a}	177.13±11.03^{c}	174.46±8.76^{c}
%	21.73±0.24	21.25±0.49	21.20±0.50	22.16±0.39
Neck*				
Weight (g)	85.50±3.79^{b}	138.61±2.67^{a}	71.13±3.85^{c}	61.77±3.30^{c}
%	8.65±0.39	8.68±0.19	8.55±0.18	7.85±0.22
Legs*				
Weight (g)	301.26±7.71^{b}	506.45±6.18^{a}	257.11±14.53^{c}	236.05±7.50^{c}
%	30.42±0.30^{b}	31.68±0.21^{a}	30.63±0.31^{ab}	30.13±0.42^{b}
Wings*				
Weight (g)	143.07±3.35^{b}	219.15±5.89^{a}	120.40±5.52^{c}	111.21±4.04^{c}
%	14.45±0.15	13.70±0.27	14.52±0.34	14.18±0.18
Cutting loss* %	1.36±0.20	1.17±0.29	1.41±0.25	1.87±0.19

In first row A-PD1 × PD4, B-PD1 × PB2, R-PD1 × PD3, W-PD1 × IWI. *Weight expressed as % of eviscerated carcass weight other traits expresses as % of pre- slaughtered live weight. Average showing one common superscript in common within a row did not differ significantly P<0.05.

Table 2. Carcass quality traits at 18 weeks of age in different crossbreds

Traits	A	B	R	W
Pre-slaughter B.wt.	2240±106.47^{b}	2670±34.77^{a}	2219±80.60^{b}	2032±64.73^{b}
Blood loss				
Weight (g)	93.5±14.08	84.17±17.08	88.83±8.60	100.33±5.19
%	3.91±0.43	3.15±0.63	3.97±0.32	4.93±0.16
Feather loss				
Weight (g)	124.83±8.20	137.67±12.80	122.50±6.71	126.00±5.48
%	5.39±0.45	5.15±0.46	5.59±0.44	6.24±0.28
Head				
Weight (g)	93.83±6.00	86.92±2.94	76.55±4.07	82.83±4.83
%	4.03±0.29^{a}	3.26±0.11^{b}	3.44±0.11^{b}	4.070±.19^{a}
Shank				
Weight (g)	106.42±6.51^{b}	133.05±3.64^{a}	96.0±3.93^{b}	80.67±2.78^{c}
%	4.53±0.11^{b}	5.08±0.19^{a}	4.32±0.06^{c}	3.97±0.10^{c}
Eviscerated carcass				
Weight (g)	1703.17±72.82^{b}	1980.50±3.96^{a}	1549.50±63.84^{b}	1389.17±49.20^{c}
%	72.85±0.87^{b}	74.15±0.57^{a}	69.79±0.73^{c}	68.35±0.75^{cs}
Heart				
Weight (g)	9.50±2.59	11.17±1.41	10.67±0.73	10.67±1.05
%	0.39±0.09	0.42±0.05	0.48±0.02	0.52±0.04
Liver				
Weight (g)	37.63±2.02	43.01±1.72	38.43±1.88	37.42±2.00
%	1.61±0.06	1.61±0.06	1.74±0.07	1.85±0.10
Gizzard				
Weight (g)	42.25±2.63^{b}	57.10±0.44^{a}	46.82±1.93^{b}	43.53±2.08^{b}
%	1.81±0.10	2.14±0.03	2.11±0.04	2.16±0.16
Giblet				
Weight (g)	89.38±5.48^{b}	110.62±2.16^{a}	95.92±3.70^{b}	91.62±2.34^{b}
%	3.81±0.11	4.17±0.08	4.32±0.07	4.54±0.20
Abdominal fat				
Weight (g)	2.80±2.80	0.00±0.00	9.45±4.09	18.88±11.05
%	0.19±0.10	0.00±0.00	0.42±0.19	0.88±0.50
Breast*				
Weight (g)	399.67±12.04^{b}	489±13.88^{a}	368.17±25.80^{bc}	337.50±12.14^{c}
%	23.53±0.37	24.70±0.57	23.68±1.08	24.31±0.42
Back*				
Weight (g)	332.17±16.31^{b}	384.17±10.73^{a}	309.50±10.28^{bc}	288.83±17.42^{c}
%	19.49±0.35	19.39±0.35	20.03±0.42	20.71±0.56
Neck*				
Weight (g)	150.17±7.13^{ab}	179.83±5.95^{a}	152.67±9.02^{ab}	122.83±3.24^{b}
%	8.83±0.29	9.07±0.19	9.99±0.61	8.88±0.27
Legs				
Weight (g)	566.33±28.14^{b}	659.67±14.04^{a}	503.83±21.25^{c}	437.50±16.86^{d}
%	33.21±0.29	33.32±0.46	32.53±0.50	31.51±0.62
Wings*				
Weight (g)	235.83±8.95^{b}	266.17±7.78^{a}	211.00±11.41^{bc}	190.33±6.53^{c}
%	13.87±0.27	13.43±0.25	13.59±0.24	13.74±0.45
Cutting loss*%	1.07±0.31	0.08±0.05	0.28±0.16	0.86±0.37

In first row A-PD1 × PD4, B-PD1 × PB2, R-PD1 × PD3, W-PD1 × IWI. *Weight expressed as% of eviscerated carcass weight other traits expresses as% of pre-slaughtered live weight. Average showing one common superscript in common within a row did not differ significantly P<0.05.

significantly (P<0.05) higher in A for all the cut up parts (Table 1). In all the genetic group legs cut was maximum followed by breast, back, wings and neck. Similar observations were observed by Mandal *et al.* (2007) and Isidahomen *et al.* (2012) in different crossbreds and indigenous chickens, respectively. Cut up parts expressed as% of eviscerated carcass weight were significant (P<0.05) only for leg cut between genetic groups. Breast% obtained in the present study was lower than the report of Muthukumar *et al.* (2011) and Thutwa *et al.* (2012).

Carcass traits at 18 weeks: Pre-slaughtered body weight differ significantly (P<0.05) between genetic groups however, non significant pre slaughter body weight was observed in A, R and W indicating that at 18 weeks of age pre-slaughtered body weight was comparable in R, W and A (Table 2). Blood loss weight and blood% did not differ between genetic groups at 18 weeks of age. Feather loss both on weight and% basis did not differ significantly (P<0.05) between genetic groups indicating as the age advances towards maturity the feather weight% remain similar. None significant feather loss both in weight and% basis was reported by Mandal *et al.* (2007) in different crosses and the% feather loss was comparable to the present findings. Head expressed as% basis was significant (P<0.05) between genetic groups. Shank+feet expressed both as% of live weight and on weight basis differ significantly (P<0.05) between genetic groups. Significant (P<0.05) effect of genotype on shank weight and% was reported by Thutwa *et al.* (2012). Eviscerated carcass weights as well as% were significant (P<0.05) between genetic groups. Highest% and weight was obtained in B. Significant (P<0.05) differences for carcass weight between genetic groups were reported in literature (Padhi *et al.* 1999, Reddy *et al.* 2008, Muthukumar *et al.* 2011). The% obtained in the present study was comparable to the report of Reddy *et al.* (2008 and Thutwa *et al.* (2012), however the eviscerated% obtained in B was higher this may be due to better body weight of the birds during slaughter and the unique character of this cross to yield better. Ready to cook yield of more than 80% in commercial broiler was reported by Nikolova and Boskovic (2009) which was comparable to our finding in B. At 18 weeks of age gizzard and giblet showed significant (P<0.05) difference between genetic groups whereas, heart, liver, gizzard and giblet expressed as% of pre slaughter live weight did not differ significantly (P<0.05) between genetic groups. Significant (P<0.05) heart, liver and gizzard% measured at 20 weeks reported by Thutwa *et al.* (2012) and at 6 weeks by Reddy *et al.* (2008). No significant (P<0.05) difference between genetic groups for these traits was reported by Mandal *et al.* (2007). Variation in the reported literature may be due to genetic makeup of the crossbreds. Abdominal fat% did not differ significantly (P<0.05) between genetic groups both on weight and% basis and large variation were observed between genetic groups and also within genetic group. No traceable fat was present in B indicating the effect of feed restriction in this crossbred, however, all the crossbreds male showed very less fat%. High fat% in broiler type crosses was report by Reddy *et al.* (2008). Comparable fat% in crossbred was report by Padhi *et al.* (1997).

Cut up parts weight differ significantly (P<0.05) between genetic groups but different cutup parts expressed as% of eviscerated weight did not differ significantly between genetic groups for any of the cut up parts (Table 2). In all the genetic groups the legs cut weight was highest followed by breast, back, wings and neck. Significant (P<0.05) difference between genetic groups for cut up parts weight in crossbreds chicken was report by Mandal *et al.* (2007). In the same report none significant (P<0.05) differences for different cut-up parts was reported which was in agreement with the present findings. Breast% obtained in the present study was lower than the commercial broiler (Muthukumar *et al.* 2011) but better than the crossbreds having indigenous and exotic germplasm (Padhi *et al.* 1997, Mandal *et al.* 2007). Legs% obtained in the present study was comparable to the report of Padhi *et al.* (1997). Wings and back% obtained in the present study at 18 weeks of age comparable to the report of Young *et al.* (2001) and Muthukumar *et al.* (2011), respectively. Thutwa *et al.* (2012) reported comparable neck% in Tswain chicken.

Age effects on carcass traits: Effect of age on body weight in genetic group showed significant (P<0.05) difference (Table 3). Significant (P<0.05) effect of age on body weight was also reported in slow growing chicken (Poltowicz and Doktor 2012). Effect of age on blood loss weight were significant (P<0.05) in A, R and W and nonsignificant for blood% in all the genetic groups. Effect of age on feather weight shows significant (P<0.05) difference for all the genetic groups except B. However, on% basis W shows only significant (P<0.05) difference between 10 and 18 weeks of age. Head weight differ significantly (P<0.05) between ages for all the genetic groups but head weight expressed as% of live weight did not differ significantly (P<0.05) between 10 and 18 weeks of age in all the 3 genetic groups. Age showed significant (P<0.05) effect on shank weight but shank+feet expressed as% of live weight showed significant (P<0.05) effect for A and R cross. Except B other three genetic groups showed reduction in% of shank+feet at 18 weeks of age compared to 10 week. Age effect on eviscerated weight was significant in all the crosses, however the effect of age on eviscerated% was only significant (P<0.05) in B. Significant (P<0.05) effect of age of slaughter on eviscerated weight was reported by Padhi *et al.* (1999) in White Leghorn cockerel. As the age of slaughter increases the eviscerated carcass% increases in all the crosses which was in agreement with the report of Poltowicz and Doktor (2012) and Nikolova abd Boskovic *et al.* (2011). Significantly (p<0.05) higher evisceration% at 18 weeks of age compared to 10 weeks was reported by Padhi *et al.* (1999) which was in agreement

Table 3. Effect of age on different carcass quality traits in different crosses

Traits	A		B		R		W	
	Weight	%	Weight	%	Weight	%	Weight	%
Live wt								
10 wk	1382**	-	2228**	-	1194**	-	1174**	-
18 wk	2240	-	2670	-	2219	-	2032	-
Blood loss								
10 wk	46.86**	3.40	81	3.65	52.65**	4.44	64.50**	5.47
18 wk	93.5	3.91	84.17	3.15	88.83	3.97	102.83	4.93
Feather								
10 wk	78.26**	5.64	125.2	5.62	68.16**	5.71	89.48**	7.62*
18 wk	124.83	5.39	137.67	5.15	122.50	5.59	82.83	6.24
Head								
10 wk	59.33**	4.29	74.55**	3.34	50.74**	4.28	53.58**	4.54
18 wk	93.83	4.03	86.92	3.26	76.55	3.44	82.83	4.070
Shank+feet								
10 wk	71.68**	5.19**	110.38**	4.96	60.53**	5.10**	52.83**	4.51
18 wk	106.42	4.53	133.05	5.08	96.0	4.32	80.67	3.97
Carcass								
10 wk	990.25**	71.65	1598.88**	71.79**	833.25**	69.76	784.75**	66.88
18 wk	1703.17	72.85	1980.50	74.15	1549.50	69.79	1389.17	68.35
Heart								
10 wk	6.95	0.50	9.40	0.42	6.86**	0.56	5.59**	0.48
18 wk	9.50	0.39	11.17	0.42	10.67	0.48	10.67	0.52
Liver								
10 wk	26.4**	1.89	41.16	1.85**	24.20**	2.02*	27.83**	2.38*8
18 wk	37.63	1.61	43.01	1.61	38.43	1.74	37.42	1.85
Gizzard								
10 wk	31.10**	2.25*	56.96	2.55	31.20**	2.61	35.30**	3.01*8
18 wk	42.25	1.81	57.10	2.14	46.82	2.11	43.53	2.16
Giblet								
10 wk	64.09**	4.63**	107.53	4.82**	62.26**	5.20**	68.71**	5.87**
18 wk	89.38	3.81	110.62	4.17	95.92	4.32	91.62	4.54
Abd. fat								
10 wk	4.93	0.34	18.61**	0.83**	4.50	0.35	0.60**	0.05
18 wk	2.80	0.19	0.00	0.00	9.45	0.42	18.88	0.88
Breast								
10 wk	231.69**	23.38	375.76**	23.53	195.85**	23.50	186.68**	23.82
18 wk	399.67	23.53	489.00	24.70	368.17	23.68	337.50	24.31
Back								
10 wk	215.08**	21.73**	340.17**	21.25*	177.13**	21.20	174.46**	22.16*
18 wk	332.17	19.49	384.17	19.39	309.50	20.03	288.83	20.71
Neck								
10 wk	85.50**	8.65	138.61**	8.68	71.13**	8.55*	61.77**	7.85*
18 wk	150.17	8.83	179.83	9.07	152.67	9.99	122.83	8.88
Legs								
10 wk	301.26**	30.42**	506.45*8	31.68**	257.11*8	30.63*	236.05**	30.13
18 wk	566.33	33.21	659.67	33.32	503.83	32.53	437.50	31.51
Wings								
10 wk	143.07**	14.45	219.15**	13.70	120.40**	14.52	111.21**	14.18
18 wk	235.83	13.87	266.17	13.43	211.00	13.59	190.33	13.74

In first row A-PD1 × PD4, B-PD1 × PB2, R-PD1 × PD3, W-PD1 × IWI.** significant at $P<0.01$, *significant at $P<0.05$ between two ages for a particular trait in one genetic group.

in B. Eviscerated yield indicates that the age of slaughter may be at 18 weeks of age of the male for better carcass yield. Heart weight was significantly (P<0.05) higher at 18 weeks compared to at 10 weeks in R and W cross however, heart% did not differ significantly (P<0.05) between the two ages in all the genetic groups which was in agreement with the report of Poltowicz and Doktor (2012). Liver weight and% were significant (P<0.05) with in all the genetic groups between two ages of measurement except in A for liver% and in B for liver weight. Significant (P<0.05) reduction in liver% at later age of measurement was reported by Poltowicz and Doktor (2012). Gizzard both on weight and% basis differ significantly (P<0.05) between 2 ages in all the crosses except B. Significant (P<0.05) reduction in gizzard% at later age of slaughtered compared to early age was report (Poltowicz and Doktor 2012). Significant (P<0.05) effect of age on giblet weight and % was observed in all the crosses except for giblet weight in B. Significant reduction in giblet % at 18 weeks of age compared to 10 weeks in White Leghorn cockerels was reported by Padhi *et al.* 1999. Abdominal fat weight and % significantly (P<0.05) reduced in B at 18 weeks of age compared to 10 weeks. It was mostly due to feed restriction of the birds during the growing period started from 8 weeks on wards in this cross. However, in W abdominal fat weight was significantly (P<0.05) higher at 10 weeks but on% basis except B all other cross did not show any significant (P<0.05) difference at 2 age of slaughter. Nonsignificant abdominal fat% at different age of slaughter was reported by Poltowicz and Doktor (2012).

On weight basis the cut up parts was significantly (P<0.05) higher at 18 weeks of age compared to at 10 weeks in all the four crosses which was in agreement with the report of Padhi *et al.* (1999a). However, on% basis age showed significant (P<0.05) effect for back and legs in A and B. Neck and legs in R and back and neck in W. Significant (P<0.05) effect of age in different cut up parts were report in broiler (Young *et al.* 2001) and in White Leghorn cockerels (Padhi *et al.* 1999). On numerical value the wings% decreased at 18 weeks of age compared to at 10 weeks which is desirable as the prime cut breast and legs% increases at 18 weeks of age.

The present investigation indicated that with the increase of age the eviscerated yield increases. However, gain in body weight in B male was better during first 10 weeks under intensive system of rearing. This was due to feed restriction of the birds in this cross and in other crosses *ad lib.* feed were given so there was more gain in body weight. Thus the male of the cross produced for backyard poultry farming may be sacrificed for better profit at 10 weeks if reared under intensive system. However, the male has the potential to gain higher body weight up to 18 weeks of age and better carcass yield. Though it may not be profitable to rear the male for 18 weeks of age under intensive system for higher yield, but under backyard system where the cost of rearing and feed is negligible the male may be kept up to 18 weeks of age. Performance of B cross was best for most of the carcass quality attributes amongst the crosses.

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