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Comparative Assessment of Carcass Traits in Indigenous Chicken

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ABSTRACT

A study was conducted to find out the differences in carcass traits among the Cobb-400, Vanraja, Aseel and Kadaknath Breeds of chicken. Cobb-400 showed significantly (P<0.05) higher live weight and dressing percentage than indigenous breeds (Vanrja, Aseel and Kadaknath) at the age of six week. Hot carcass weight as well as cold carcass weight were significantly (P<0.05) higher in comparison to studied indigenous breeds. The same pattern was reported for meat bone ratio and meat yield. Among all indigenous breeds Aseel showed highest live weight, dressing percentage, hot and cold carcass weight as well as meat bone ratio and meat yield. However, these values were comparable between Vanraja and Kadaknath breeds. The carcass traits values overall had lower values than most of the studied reports which might be due to lower slaughter age of indigenous breed used in present study. So the need is to upgrade the growth status of indigenous chicken breeds to meet out the daunting demand of meat of these breeds.

Keywords: Chicken, Cobb-400, vanraja, aseel, kadaknath, carcass traits

The consumption of poultry meat has been steadily on the rise across homes and hospitality. Factors governing the consistent growth in poultry meat consumption include easy availability of the product as well as social acceptance as a protein rich item in culinary tradition. Broilers of various breeds, particularly Cobb-400 chicken is the most sought in India after considering its high growth, quality and superior characteristics. The breed is the first choice of independent poultry farmers, and has achieved a market share over 80% among independent broiler farmers. However, indigenous chickens are an important source of animal proteins (Roberts *et al.* 1999) and could be very helpful in combating the nutritional deficiencies and generating income for the rural masses, especially in the developing countries. Moreover, the better adaptability of native chicken breeds to the local climatic conditions (Romanov *et al.* 1996) and greater robustness over the commercial chicken make them a preferred choice to raise them with lesser amount of capital and under the inclement conditions.

The Aseel and Kadaknath are two important native chicken breeds in India. The Aseel breed is known forits stamina, pugnacity, majestic gait, and dogged fighting qualities (Panda and Mahapatra, 1989). The pure breeds of Aseel are still found in its breeding tract, namely, in the state of Andhra Pradesh and in some areas of the states of Rajasthan and Madhya Pradesh. The Aseel (Yellow) and Aseel (Black) varieties are commonly available among the 8 varieties of the Aseel breed described in the literature (Panda and Mahapatra 1989). This breed is characterized by its hardiness and ability to thrive under adverse climatic conditions, and its meat is considered to have a desirable taste and flavor. In contrast, the Kadaknath breed, also known as Kalamashi in Hindi, is known for its black-colored meat. It is being reared by tribal communities in its breeding tract of the Jhabua and Dhar districts in the western region of the state of Madhya Pradesh and in adjoining areas of the states of Gujarat and Rajasthan. Although the meat of this breed has an unattractive appearance, it has a delicious flavor (Panda and Mahapatra 1989). The meat and eggs are considered rich sources of protein. Mohan *et al.* (2008) reported that the meat of the Kadaknath breed contains high percentage (25.47%) of protein and is believed to have aphrodisiac

properties. Although the Kadaknath breed has many unique characteristics, it has been neglected because of its poor production potential.

Vanaraja chicken, a dual purpose backyard variety, very much popular in many states of India especially northeast rural/tribal areas seem a fit candidate for rural livelihood security and to alleviate the widespread malnutrition in the society. Vanaraja has been developed by crossing random bred meat control population as the female line and Red Cornish population as the male line by Project Directorate on Poultry, Hyderabad (Chandra *et al.* 2004). It has superior carcass with desirable composition, maximum proportion of muscle having high proportion of most valuable muscles (i.e. breast and thighs muscles), minimum proportion of bone and optimum proportion of fat. Effects of sex on carcass characteristics of chickens were reported by Broadbent *et al.* (1981), Orr *et al*. (1984), Marks (1990), Bartov (1998), Smith and Pesti (1998), Shahin*et al.* (1996), Wiseman and Lewis (1998), Shahin and Elazeem (2005), Musa *et al.* (2006), Ojedapo (2008) and Pathak *et al.* (2009).

Although reports on performance in terms of body weight, growth rate and feed efficiency both under intensive as well as backyard farming are available in literature however, the information relating to carcass characteristics is limited. The knowledge of carcass parameters in chicken is important for the formulation of breeding plans for further improvement and from economics point of view. So a study was planned to evaluate the carcass traits of these indigenous chicken in contrast with the cobb-400, a broiler strain.

MATERIALS AND METHODS

At the age of six weeks indigenous birds of each Aseel, Kadaknath, Vanraja and Cobb-400 reared on deep litter system belongs to Instructional Poultry Farm, Department of Poultry Science, U.P. Pt Deen Dayal Upadhyay Veterinary University and Go Anusandhan Sansthan, Mathura, U.P. were used for carcass traits study as per standard procedures. The birds were starved for 12 hours before the actual slaughter. However, drinking water was provided Ad-libidum during starvation period and their body weight was recorded after starvation. The birds were slaughtered by Halal method by cutting the jugular vein, bled for 1.5 to 2 minutes and then scalded at 55^{o}C for 2 minutes and manually defeathered to record defeathered weight. Dressing was performed by separating the head and shank to record dressed weight. Evisceration was done by making a slit opening at the skin to find and remove oesophagus and trachea, and below the breast bone to remove viscera and eviscerated weight was recorded. Heart, liver and gizzard were separated and cleaned. Pericardium of heart, gallbladder of liver, and internal layer of gizzard lining were removed before weighing them separately to record their weight individually and also weight them together to record giblet weight. The hot carcass weight was recorded immediately after slaughter while cold carcass weight was computed after 24 hrs of storage under refrigeration (4±2^{o}C) in Low Density Polyethylene (LDPE) packages. The corresponding percent weight of all carcass traits were computed with respect to their live weight, cold and hot carcass weight basis and shown in figures. The data obtained was subjected to Analysis of Variance (ANOVA) and level of homogeneity following the procedure of Snedecor and Cochran, 1994 using SPSS statistics 16 software.

RESULTS AND DISCUSSION

Carcass traits

The carcass traits values like live weight (g), dressing percentage, hot carcass weight (g), cold carcass weight (g), meat bone ratio, meat yield (g) in male, female and pooled sex are presented in Table 1 to 3 respectively while percent values of dressing percentage, hot carcass weight, cold carcass weight meat yield and trimmings in male, female, pooled sex as well as comparative male and female values are given in figure 1 to 4 respectively.

Live weight (g)

The average live weight recorded was 880.33±39.79 in Cobb-400, 399.00±22.79 in Vanraja, 475.33±30.14 in Aseel and 379.00±17.30 in Kadaknath male breeds of chicken at the age of six weeks under deep litter system. The corresponding values for female birds were 871.68±39.70 in Cobb-400, 385.68±13.98 in Vanraja, 468.67±20.97 in Aseel and 371.01±17.20 in Kadaknath. When pooled over sexes the values were 876.00±26.82 for Cobb-400, 392.34±12.90 for Vanraja, 472.00±17.53 for Aseel and 375.01±11.69 for Kadaknath birds respectively. The live

Table 1: Carcass traits values of indigenous male chickens (Mean±SE)

Carcass traits	Chicken breeds/strains			
	Cobb-400	**Vanraja**	**Aseel**	**Kadaknath**
Live weight (g)	880.33^{a}±39.79	399.00^{bc}±22.79	475.33^{b}±30.14	379.00^{c}±17.30
Dressing percentage	65.27^{a}±1.69	60.26^{b}±0.81	62.24^{ab}±1.33	61.37^{b}±0.85
Hot Carcass weight (g)	574.68^{a}±17.53	240.47^{c}±11.79	295.88^{b}±3.45	232.63^{c}±6.85
Cold carcass weight (g)	516.01^{a}±11.46	234.88^{c}±6.11	279.55^{b}±12.85	217.19^{c}±4.09
Meat bone ratio	2.77^{a}±0.17	2.22^{b}±0.08	2.30^{b}±0.08	2.01^{b}±0.04
Meat yield (g)	293.01^{a}±6.16	91.14^{c}±0.91	156.05^{b}±9.16	94.97^{c}±3.10

Means bearing different superscripts (a, b, c, d) within row differ significantly (P<0.05)

Table 2: Carcass traits values of indigenous female chickens (Mean±SE)

Carcass traits	Chicken breeds/strains			
	Cobb-400	**Vanraja**	**Aseel**	**Kadaknath**
Live weight (g)	871.68^{a}±39.70	385.68^{c}±13.98	468.67^{b}±20.97	371.01^{c}±17.20
Dressing percentage	65.00^{a}±1.69	60.62^{b}±0.78	61.70^{ab}±1.31	61.80^{ab}±0.85
Hot Carcass weight (g)	566.68^{a}±16.51	233.81^{c}±11.66	289.21^{b}±3.63	229.30^{c}±6.77
Cold carcass weight (g)	506.01^{a}±11.50	221.54^{c}±6.44	276.88^{b}±11.60	214.54^{c}±4.11
Meat bone ratio	2.56^{a}±0.16	2.03^{b}±0.08	2.12^{b}±0.08	1.98^{b}±0.04
Meat yield (g)	284.34^{a}±6.27	88.49^{c}±1.01	153.71^{b}±9.13	93.65^{c}±3.03

Means bearing different superscripts (a, b, c, d) within row differ significantly (P<0.05)

Table 3: Carcass traits values of indigenous pooled sex chickens (Mean±SE)

Carcass traits	Chicken breeds/strains			
	Cobb-400	**Vanraja**	**Aseel**	Kadaknath
Live weight (g)	876.00^{a}±26.82	392.34^{c}±12.90	472.00^{b}±17.53	375.01^{c}±11.69
Dressing percentage	65.13^{a}±1.14	60.44^{b}±0.54	61.97^{b}±0.89	61.59^{b}±0.57
Hot Carcass weight (g)	570.68^{a}±11.54	237.14^{c}±7.97	292.55^{b}±2.59	230.96^{c}±4.62
Cold carcass weight (g)	511.01^{a}±7.88	228.21^{c}±4.68	278.21^{b}±8.26	215.86^{c} ±2.79
Meat bone ratio	2.66^{a}±0.12	2.13^{b}±0.06	2.21^{b}±0.06	1.99^{b}±0.03
Meat yield (g)	288.67^{a}±4.39	89.82^{c}±0.76	154.88^{b}±6.18	94.31^{c}±2.08

Means bearing different superscripts (a, b, c, d) within row differ significantly (P<0.05)

weight of male indigenous breeds showed significant (P>0.05) differences between Aseel and Kadaknath while live weight of Vanraja was comparable to Aseel and Kadaknath. In comparison of live weight of male Cobb-400 with corresponding indigenous breeds, it was evident that live weight of Cobb-400 was significantly (P<0.05) higher than all indigenous breeds. The live weight of female indigenous breeds showed significant (P<0.05) differences between Aseel to Vanraja and Kadaknath while later two were no significantly different with each other. Live weight of female Cobb-400 in comparison with all female indigenous chicken showed significantly (P<0.05) higher values. The level of significance in pooled sex chicken was also similar to the pattern reported for female indigenous chicken and female Cobb-400.

In study, the significant (P<0.05) higher live weight was noticed in Cobb-400 as compared to all indigenous breeds which might be due to higher growth rate in previous chicken. In indigenous breeds, highest weight was recorded in Aseel followed by Vanraja and Kadaknath irrespective of the sex.

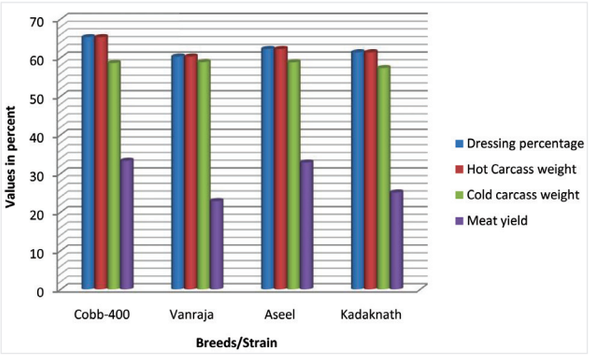

Fig. 1: *Percent carcass traits values of indigenous male chickens*

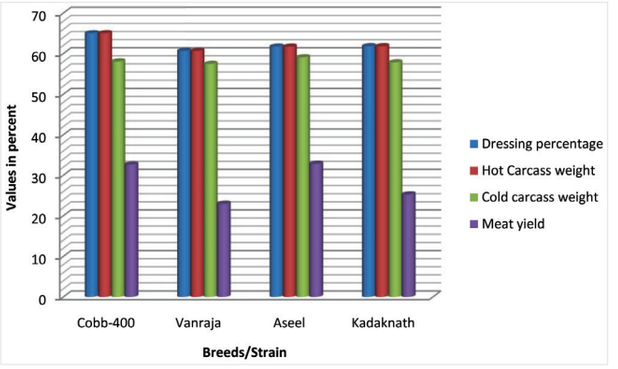

Fig. 2: *Percent carcass traits values of indigenous female chickens*

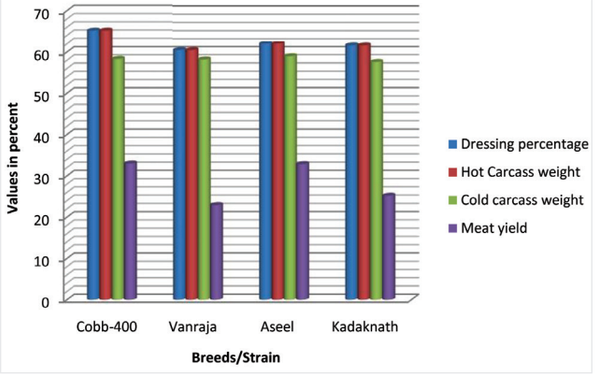

Fig. 3: *Percent carcass traits values of indigenous pooled sex chickens*

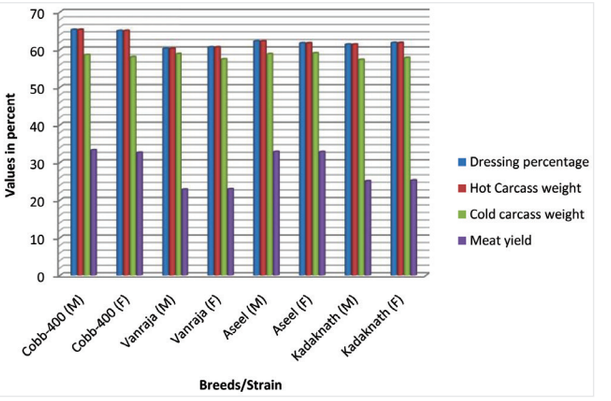

Fig. 4: *Comparative percent carcass traits values of male and female indigenous chicken Where- M=Male, F=Female*

Dressed weight (%)

Dressed weight recorded were 65.27±1.69, 60.26±0.81, 62.24±1.33 and 61.37% in males of Cobb-400, Vanraja, Aseel and Kadaknath respectively. The corresponding mean percent dressed weight recorded were 65.00±1.69, 60.62±0.78, 61.70±1.31 and 61.80±0.85 in females of Cobb-400, Vanraja, Aseel and Kadaknath respectively. For pooled sex, the percent dressed weight computed were 65.13±1.14, 60.44±0.54, 61.97±0.89 and 61.59±0.57 in Cobb-400, Vanraja, Aseel and Kadaknath respectively. Percent wise the pattern of dressing percent from higher to lower were as Cobb-400>Aseel>Kadaknath>Vanraja in the male and pooled sex birds while the pattern of decreasing dressed weight in female chicken were Cobb-400>Kadaknath>Aseel>Vanraja.

Among all the studied indigenous chicken breeds no significant differences were noticed among each other in both of the sexes as well as on pooled sex basis. However, dressing percentage of Cobb-400 with indigenous male chicken showed significant (P<0.05) difference with Vanraja and Kadaknath and no significant difference with Aseel. In female, dressing percentage of Cobb-400 was significantly (P<0.05) higher than Vanraja while no significant difference was observed from Aseel and Kadaknath. On pooled sex basis, dressing percentage of Cobb-400 was showing significantly (P<0.05) higher values than all indigenous breeds.

The values obtained on dressing percentage of these breeds were lower than the dressing percentage values reported by Vijh *et al.* (2005) in Miri birds, Tantia*et al*. (2006) in

Ankaleshwar breed, Kumar *et al*. (2012) in Vanraja breed, Sharma and Khedkar (2005) in Kadaknath and Doley *et al.* (2009) in indigenous chicken of Northeast. The lower percentage of dressing in these breeds might be due to the selection of lower aged birds in present study in comparison to the birds studied by these workers. The findings were very well supported by the reports of Sriniwas*et al.* (2014) for broilers as well as Kandir and Yardimci (2015) for ducks with certain probiotics treatments.

Hot carcass weight (g)

The hot carcass weight recorded was 574.68±17.53, 240.47±11.79, 295.88±3.45 and 232.63±6.85 in male birds of Cobb-400, Vanraja, Aseel and Kadaknath respectively. The corresponding female birds of these breeds showed the hot carcass weight as 566.68±16.51, 233.81±11.66, 289.21±3.63 and 229.30±6.77 respectively. The respective hot carcass weight on pooled sex basis was 570.68±11.54, 237.14±7.97, 292.55±2.59 and 230.96±4.62 in Cobb-400, Vanraja, Aseel and Kadaknath respectively. Percent wise these values were similar to the values shown in dressing percentage for a particular bird and sex.

In all indigenous breeds irrespective of sex as well in pooled sex chicken hot carcass weight of Aseel was significantly ($P<0.05$) higher than Vanraja and Kadaknath while no significant differences were observed in between Vanraja and Kadaknath. On comparison of hot carcass weight of Cobb-400 with all indigenous chicken breeds, it was found that Cobb-400 had significantly ($P<0.05$) higher weight.

The values obtained on hot carcass weight of these breeds were lower than the weight reported by Vijh *et al.* (2005) in Miri birds, Tantia *et al*. (2006) in Ankaleshwar breed, Kumar *et al.* (2012) in Vanraja breed, Sharma and Khedkar (2005) in Kadaknath and Doley *et al.* (2009) in indigenous chicken of Northeast. Again the differences were due to lower slaughter age in the study as compared to the reports presented by these scientists.

Cold Carcass weight (g)

The cold carcass weight of male cobb-400, Vanraja, Aseel and Kadaknath breed was 516.01±11.46, 234.88 ± 6.11, 279.55±12.85 and 217.19±4.09 respectively. The corresponding female cold carcass weight recorded was 506.01±11.50, 221.54±6.44, 276.88±11.60 and 214.54 ± 4.11 in Cobb-400, Vanraja, Aseel and Kadaknath respectively. The average pooled sex cold carcass weight in Cobb-400, Vanraja, Aseel and Kadaknath was 511.01±10.23, 228.21±4.68, 278.21±8.26 and 215.86±2.79 respectively. Percent wise the pattern of higher to lower cold carcass weight in male carcass was as Vanraja (58.86±0.99)>Aseel (58.81±0.76), Cobb-400 (58.61±0.44)>Kadaknath (57.30±0.34) and in female as Aseel (59.07±0.23)>Cobb-400(58.04±0.66)>Kadaknath (57.82±0.67)>Vanraja (57.44±0.28). Pooled sex cold carcass percent weight in decreasing order was computed as Aseel (58.94±1.02) >Cobb-400 (58.33±0.89)>Vanraja (58.16±0.56) >Kadaknath (57.56±0.73).

In all indigenous breeds irrespective of sex as well in pooled sex chicken cold carcass weight of Aseel was significantly ($P<0.05$) higher than Vanraja and Kadaknath while no significant differences were observed in between Vanraja and Kadaknath. On comparison of cold carcass weight of Cobb-400 with all indigenous chicken breeds, it was found that Cobb-400 had significantly ($P<0.05$) higher weight.

Higher percentage of cold carcass weight in Aseel as compared to other breeds of chicken in female and pooled sex and second highest in male chicken breeds could be due to better stability as refrigeration storage which might be due to higher muscle activities in this breed.

Meat Bone ratio

The meat bone ratio recorded was 2.77±0.17, 2.22±0.08, 2.30±0.08 and 2.01±0.04 in male Cobb-400, Vanraja, Aseel and Kadaknath respectively. The corresponding female Cobb-400, Vanraja, Aseel and Kadaknath chicken meat bone ratio was computed as 2.56±0.16, 2.03±0.08, 2.12±0.08 and 1.98±0.04 respectively. When pooled over sexes the values of meat bone ratio were 2.66±0.12, 2.13±0.06, 2.21±0.06 and 1.99±0.03 for Cobb-400, Vanraja, Aseel and Kadaknath respectively.

On analysis with level of significance, the meat bone ratio of Cobb-400 was significantly ($P<0.05$) higher than the ratio obtained in all studied indigenous chicken breeds of either sex as well as in pooled sex birds. However, among the entire indigenous breeds irrespective of sex and also in pooled sex meat bone ratio was not showing any significant difference with each other.

The meat bone ratio in male of all breeds showed higher values than females and the pattern was supported by the findings of Kumar *et al.* (2012) and Pathak *et al.* (2009) on adult Vanraja breeds. However, the findings of present study were reverse to the reports given by Orr and Hunt (1984) as well as the findings reported by Hayes and Marion (1973).

Meat Yield (g)

The meat yield in male Cobb-400 was recorded as 293.01±6.16 while 91.14±0.91 in Vanraja, 156.05±9.16 in Aseel and 94.97±3.10 in Kadaknath male birds. The corresponding females had the meat yield as 284.34±6.27, 88.49±1.01, 153.71±9.13 and 93.65±3.03 in Cobb-400, Vanraja, Aseel and Kadaknath respectively. On calculation as pooled sex basis meat yield was noticed as 288.67±4.39 for Cobb-400, 89.82±0.76 for Vanraja, 154.88±6.18 in Aseel and 94.31±2.08 in Kadaknath. The percent meat yield in male birds on live weight basis was found in the order of Cobb-400 (33.28±0.16) > Aseel (32.82±0.17) >Kadaknath (25.05±0.26) >Vanraja (22.84±0.09) from higher to lower. The pattern was also same in pooled sex chicken meat yield but the percent values obtained were 32.95±0.17, 32.81±0.22, 25.14±0.29 and 22.89±0.11 inCobb-400, Aseel, Kadaknath and Vanraja respectively. In female chicken percent meat yield values from higher to lower were Cobb-400 (32.61±0.13)>Aseel(32.79±0.19) >Kadaknath (25.24±0.23)>Vanraja (22.94±0.17).

In all indigenous breeds irrespective of sex as well in pooled sex chicken meat yield of Aseel was significantly ($P<0.05$) higher than Vanraja and Kadaknath while no significant differences were observed in between Vanraja and Kadaknath. On comparison of meat yield of Cobb-400 with all indigenous chicken breeds, it was found that Cobb-400 had significantly ($P<0.05$) higher weight.

The meat yield data obtained in the study were well justified with the findings of Kumar *et al.*(2012), Verma *et al.* (2015), Yadav *et al.* (2009) and Pathak *et al.* (2009). However, lower meat yield was recorded in studied breeds in comparison to the findings of meat yield on Black rock, red Cornish and Vanraja by Debata *et al.* (2012).

In present study, the carcass traits like live weight, dressing percentage, hot carcass weight, cold carcass weight, meat bone ratio and meat yield was observed highest in Cobb-400 while among indigenous breeds Aseel was dominating on these traits. So on that basis it can be concluded that the used of Aseel among indigenous breeds may be more beneficial for commercial exploitation.

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