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A study on carcass quality traits of a back cross progeny from Hansli and coloured broiler chicken

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Abstract
A total of 120 straight run day-old chicks, 60 each of the 2 genotype groups (i) Group-I: Colored synthetic broiler (CSML ♂ x CSFL ♀) crosses; (ii) Group-II: (Hansli x CSML) ♂ x CSML ♀ crosses were taken and divided into 3 replicates. Results obtained showed chicks in group-I having significantly ($p \leq 0.05$ or 0.01) higher live weight, dressed weight, eviscerated weight, liver weight, drumstick weight, wings weight, back weight and giblet%. Numerically the dressing% was higher in group-II than group-I ($p > 0.05$). Birds in group-II showed superior meat quality through higher ($P \geq 0.05$) moisture and crude protein, and lower ether extract for both thigh and breast muscle.

Keywords: Hansli, coloured broiler, back cross, carcass traits, meat quality

Introduction
Commercial broiler production plays a pro-vital role to meet up the growing demand of high quality animal protein in the human diet in India. It is one of the outmost important rapid growing industries for reducing the huge deficiency of animal protein as well as poverty level of this country. Poultry are the most commonly kept livestock species and have been reared as an integral part of the mixed agricultural system throughout India. Among the various aspects in poultry science, improvement in genetic makeup by various breeding methods is an important aspect to improve the production. Crossbreeding has been a key tool for the development of today's commercial breeds of chickens [6] and could equally be used to improve the rural chicken. Crossbreeding of indigenous chickens with fast-growing commercial birds will make full use of natural selection for resistance, and artificial selection for productivity in exotic chickens [2]. The optimal crossbred chicken would have higher growth rate, feed conversion efficiency, reproductive and carcass performance, without sacrificing adaptation to the local environment [2]. To utilize the good adaptive characteristics of the indigenous chickens and possibly exploit the phenomenon of heterosis proposed that crossbreeding programs including upgrading local chickens with suitable exotic stocks would be more appreciable [5]. Heterosis has become a routine tool for poultry breeders to produce progeny that exhibit more desirable phenotypes than those of their parental populations. Theoretically, the magnitude of heterosis is inversely related to the degree of genetic resemblance between parental populations [8] and is expected to be proportional to the degree of heterozygosity of the crosses [6]; thus heterosis is a result of non-additive genetic effects and may be viewed as overall fitness as well as expression of a specific trait. Heterosis is measured by crossing populations to produce an F1 generation, which is compared to the parental populations. It may reflect specific or general combining ability and is not permanent because of recombination, among other factors, in subsequent generations. The breeding objectives should focus on the development of a chicken crossbred that would be adaptable to the local climatic conditions and be suitable for backyard as well as commercial rearing, while retaining the characters of the indigenous chicken such as plumage color and meat quality. In view of the afore said, the present study has been undertaken to study the broiler traits of crosses of native and coloured parent line in respect of their carcass characteristics and meat quality.

Materials and methods
The study was carried out in the Poultry Complex of College of Veterinary Science and Animal Husbandry, Orissa University of Agriculture and Technology, Bhubaneswar.

Performance of two genotypes of broiler chicken was taken in the study. The genotypes were; (i) Group-I: Colored synthetic broiler (CSML ♂ x CSFL ♀) crosses; (ii) Group-II: (Hansli x CSML) ♂ x CSML ♀ crosses. Adult Colour synthetic male line (CSML) males and Colour synthetic female line (CSFL) females at the age of 40 weeks were housed in breeding pens in the ratio 1:7. Seven CSML males and fifty CSFL females were used for the cross breeding. Simultaneously, (Hansli X CSML) males and CSML females were maintained in the same ratio to obtain pure eggs. A total of 120 straight run day-old chicks, 60 each of the 2 genotype groups were taken and divided into 3 replicates each comprising 20 chicks. The chicks were wing banded, weighed and randomly distributed in separate pens on a deep litter system with standard management practices.The experimental birds were vaccinated against various infectious diseases. Brooding of chicks was done up to three weeks with a brooding space of 0.5 ft^2/chick by using a 100 watt bulb in each experimental shed. Experimental chickens were fed with a standard broiler starter ration containing 22% crude protein and 3150 kcal/ kg ME for four weeks followed by a finisher diet containing 20% crude protein and 3150 kcal/ kg ME from 5^{th} week till the end of the experiment up to eight weeks. All the birds were provided with clean and fresh drinking water 24 hours.

At the end of eight weeks, six healthy birds, one from each replicate were sacrificed for carcass parameters. Two male and one female from each treatment group of (Hansli x CSML)♂ X CSML♀ and (CSML♂ X CSFL ♀) were taken to record their carcass parameter. The birds were sacrificed by improved Kosher method. The calculations were carried out as follows:

Live weight at time of slaughter (g)

1) $$\text{Dressing \%} = \frac{\text{Dressed weight}}{\text{Live weight}} \times 100$$

2) $$\text{Giblet weight \%} = \frac{\text{Giblet weight}}{\text{Live weight}} \times 100$$

3) $$\text{Neck \%} = \frac{\text{Neck weight}}{\text{Eviscerated weight}} \times 100$$

4) $$\text{Wing \%} = \frac{\text{Wing weight}}{\text{Eviscerated weight}} \times 100$$

5) $$\text{Back\%} = \frac{\text{Back weight}}{\text{Eviscerated weight}} \times 100$$

6) $$\text{Breast \%} = \frac{\text{Breast weight}}{\text{Eviscerated weight}} \times 100$$

7) $$\text{Thigh \%} = \frac{\text{Thigh weight}}{\text{Eviscerated weight}} \times 100$$

8) $$\text{Drumstick \%} = \frac{\text{Drumstick weight}}{\text{Eviscerated weight}} \times 100$$

The proximate composition such as moisture, crude protein, ether extract and total ash content of the chicken meat from the breast and thigh muscles were made according to the procedure of AOAC [1].

The data obtained from the study were statistically analyzed according to Snedecor and Cochran [7]. The data were analyzed for t- test to test the difference between means wherever necessary.

Results and discussion

Carcass traits

The mean carcass traits and mean percentage value of cut up parts for the chicks in the two groups are presented in Table 1 and 2. Higher carcass values were exhibited by group-I, though the differences were not statistically significant for some traits. This is because of higher live weight of the chicks in the group-I. When the cut-up parts were expressed as percentage of eviscerated weight and dressed weight, no difference was found between the groups, except for giblet weight which showed higher values ($p \leq 0.05$) in favour of group-I. This could be due to the fact that, group-I had significantly ($p \leq 0.05$) higher liver weight than group-II. Arora *et al.* [3] reported that the carcass quality of F_2 chicken involving Kadaknath and White Plymouth Rock like % of abdominal fat, gizzard, liver, heart, breast, legs and back, no differences was observed among various skin colour groups. They also reported that melatonic and non-melatonic carcasses did not show any significant difference for meat texture and fatness traits.

Chemical composition of meat

The proximate compositions of meat from thigh and breast muscle of the chicks in the two groups are presented in Table 3. Birds in group-II showed higher ($P \geq 0.05$) moisture and protein, and lower ether extract, compared to those in group-I. This might be due to the effect of the Hansli inheritance in the cross bred (group-II). Similar findings were also reported by Ekka *et al*. [4] who found higher moisture and protein, and lower ether extract in Hansli x CSML cross bred, compared to CSML. It was further reported that Hansli had higher moisture and protein, and lower ether extract compared to Hansli X CSML or CSML.

Table 1: Carcass traits of chicks

Parameter	Group-I(g)	Group-II(g)	Significance
Live body weight	1366.00± 12.85	1052.34± 24.73	**
Dressed weight	923.67 ±13.33	721.33±20.19	*
Eviscerated weight	843.00 ±14.16	653.34± 17.23	*
Heart	05.34±0.34	03.34± 0.34	NS
Liver	30.34±0.34	27.34±0.34	*
Gizzard	48.00±2.00	34.00±1.73	NS
Drumstick	115.34±3.18	95.67±3.49	*
Thigh	150.34±9.17	106.67±4.64	NS
Wing	112.34±3.49	86.00±3.06	*
Breast	188.67±7.84	152.67±6.36	NS
Back	192.67±7.97	143.34±5.21	**
Neck	78.66±5.37	63.00±2.52	NS

* Mean values differ significantly ($p \leq 0.05$) **Mean values differ significantly ($p \leq 0.01$)

Table 2: Cut up parts as percentage of eviscerated weight and dressed weight

Parameter		Group-I	Group-II	Significance
Dressing %	Percentage of live weight	67.62±0.38	68.53±0.31	NS
Giblet %		2.65±0.08	1.57±0.03	*
Neck %	Percentage of eviscerated weight	9.31±0.51	9.64±0.29	NS
Wing %		13.33±0.38	13.15±0.12	NS
Back %		13.33±0.38	21.98±1.05	NS
Breast %		22.41± 1.21	23.35±0.40	NS
Thigh %		17.81±0.86	16.32±0.39	NS
Drumstick %		13.70± 0.55	14.63±0.28	NS

* Mean values differ significantly ($p \leq 0.05$) **Mean values differ significantly ($p \leq 0.01$)

Table 3: Proximate composition of thigh and breast muscle

Parameters	Thigh muscle		Breast muscle		Significance
	Group I	Group II	Group I	Group II	
Moisture	68.19±3.79	69.49±1.13	73.99±0.70	74.41±0.34	NS
Crude protein	53.36±10.0	54.82±5.04	76.81±4.35	78.05±1.15	NS
Ether extract	37.23±7.59	34.50±2.98	9.69±4.38	8.17±0.99	NS
Crude fibre	0.70±0.28	0.50±0.36	0.40±0.17	0.57±0.34	NS
Total ash	4.33±0.99	3.77±0.31	5.33±0.67	5.87±0.43	NS
Acid insoluble ash	0.06±0.02	0.04±0.02	0.22±0.16	0.11±0.90	NS

Conclusion
The study revealed that, Group-I (CSML X CSFL) have superior growth performance and carcass characteristics, while group-II (Hansli X CSML) X CSML showed superior meat quality in terms of higher crude protein and lower ether extract.

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