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'Kamrupa'-A new dual chicken variety for farmers of Asom and North-East India

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ABSTRACT

A dual type multicolored new variety of chicken was developed by crossing Indigenous birds of Asom with a broiler parent PB-2, and a layer parent Dahlem Red, procured from Directorate of Poultry Research, Hyderabad. The present study aimed to study productive and reproductive performance of this variety under intensive and free range system in rural areas of Asom. During the study, body weights of the birds at all stages of growth reared under intensive rearing system were significantly higher than the free range system. The shank length, keel length and breast angle were recorded as 3.98±0.64 cm, 3.21±0.25 cm and 63.75±2.23 degree in intensive system and 4.31±0.98 cm, 3.88±0.76 cm and 62.35±2.54 degree in free range system, respectively. The pullet matured by 20.83 days earlier and laid 20.40 more eggs annually in intensive system compared to that of free range system. The egg weight at 32 weeks and 40 weeks were higher by 1.70 g and 2.66 g in intensive system than that of free range system. The egg quality traits, viz. shape index, albumin index, yolk index, Haugh unit, shell thickness and fertility and hatchability were better in free range system than that of intensive system. Most of the carcass characteristics and survivability of Kamrupa bird were slightly better in intensive system than that of the free range system. From economic point of view, Kamrupa bird's performance is slightly better in free range system than that of the intensive system.

Key words: Free range system, Intensive system, Kamrupa bird, Performance traits

The poultry sector plays a major role in upliftment of the economic condition of the rural people of India. There is a huge demand of poultry and poultry products in the North-Eastern India. The indigenous birds of Asom and North-Eastern region usually have better resistance capacity to various diseases, can escape easily from predators, multicolour and more preferred among the consumer and hence fetch more money than that of the exotic breeds. However, the people particularly of North-Eastern region have been rearing some improved breeds to get better production and profit as the indigenous chicken are inferior in reproductive and production traits. Therefore, there is a long felt need to develop a location specific variety incorporating the desirable indigenous inheritance with exotic breed having better egg and meat production capacity.

Accordingly, the Kamrupa - a multicolour dual purpose new chicken variety was developed under AICRP on Poultry Breeding, Directorate of Research by crossing the indigenous chicken with a broiler parent (PB-2, procured from Directorate of Poultry Research, Hyderabad) and a layer parent (Dahlem Red, procured from Directorate of Poultry Research, Hyderabad). The present investigation is an attempt to study and compare the different productive and reproductive traits along with egg and meat quality traits, survivability and economics of the newly developed variety of chicken (Kamrupa) under intensive and free range system of rearing.

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MATERIALS AND METHODS

Day-old chicks (2,000: male, 400; female, 1,600) were hatched, and brooded in deep litter system up to 4 weeks. After 4 weeks of age, 1,000 young birds were reared under intensive system with standard management practices (balanced ration) in the experimental unit of All India Co-ordinated Research Project on Poultry Breeding. The remaining 1,000 young birds were distributed to 20 poultry farmers (50 chicks/farmer) residing at different places of Asom, and the farmers kept the chicks under free range system. The birds under free range were allowed to scavenge whole day in nearby area of farmers house where they eat insects, earthworms, seeds, grasses, fallen grains, kitchen wastes and other edible items. In addition, the birds were provided with about 150 g of supplement, viz. maize, broken rice, rice polish depending on cereal crops the farmer

cultivate in the evening when the birds return after scavenging. The farmers provide a small shed made of locally available materials like bamboo, thatch etc. for night shelter of the birds. The vaccination and deworming of the experimental birds were done as per standard schedule in both the systems. The birds in intensive system had been provided with improve management practices like providing comfortable and safe houses, balance nutrition, proper medicine etc.

Live body weight at day-old, 8 weeks, 20 weeks, 32 weeks and 40 weeks of age were measured by taking a 3 kg salter balance to the nearest accuracy of 5 g. Confirmation traits (shank length, keel length and breast angle) are measured with the help of scale and breastometer at 5 weeks of age as these traits in meat/dual type bird proportionately attain a higher value at this age. The age at sexual maturity in the flock is considered when the 50% of the pullet starts laying egg. The record on annual egg production, egg weight at 32 and 40 weeks and survivability percentage was also collected. A total of 100 eggs each from 2 rearing systems were collected when the birds were 40 weeks of age to assess egg quality traits. To evaluate the carcass characteristics, 50 males and 50 females were selected when the birds reached 20 weeks of age randomly from each of the system. Eggs (2,000: 1,000 eggs each from to rearing systems) were collected to study fertility and hatchability within 10 days, incubated and the percent fertility and hatchability (TES and FES) were recorded. The expenditure was recorded as per existing market price for different inputs to assess the cost-benefit of rearing dual-purposed chicken variety under different rearing systems. Means and standard error of various traits were calculated using standard statistical methods (Snedecor and Cochran 1994). Significant differences between the 2 systems of rearing for various traits were tested with student's "t test". All statements of statistical difference were based on $P< 0.05$.

Table 1. Means±standard errors for various traits of Kamrupa bird both in intensive and free range system of rearing

Traits	In intensive system	In free range system
Body weight (g) at (Combined sex)		
Day old	$39.24^{a\pm}2.30$	$39.24^{a\pm}2.30$
8 weeks	$750.64^{a\pm}50.27$	$525.42^{b\pm}50.64$
20 weeks	$1750.46^{a\pm}120.31$	$1400.45^{b}\pm95.36$
32 weeks	$1960.45^{a\pm}150.56$	$1670.49^{b}\pm132.56$
40 weeks	$2200.45^{a\pm}170.29$	$1800.57^{b}\pm136.45$
Conformation traits at 5 weeks of age (Combined sex)		
Shank length (cm)	$3.98^{a\pm}0.64$	$4.31^{a\pm}0.98$
Keel length (cm)	$3.21^{a\pm}0.25$	$3.88^{a\pm}0.76$
Breast angle (º)	$63.75^{a\pm}2.23$	$62.35^{a\pm}2.54$
Age at sexual maturity (d)	$164.54^{a\pm}3.76$	$185.37^{b\pm}4.61$
Annual egg production (no.)	$145.87^{a\pm}3.56$	$125.47^{a\pm}3.96$
Egg weight (g) at		
32 weeks	$44.97^{a\pm}1.74$	$43.27^{a\pm}1.67$
40 weeks	$55.20^{a\pm}1.96$	$52.54^{a\pm}1.72$
Egg quality traits		
Shape index	$75.23^{a\pm}3.54$	$76.43^{a\pm}3.74$
Al bumin index	$0.083^{a\pm}0.001$	$0.084^{a\pm}0.001$
Yolk index	$0.401^{a\pm}0.009$	$0.403^{a\pm}0.008$
Haugh unit	$78.44^{a\pm}1.37$	$79.24^{a\pm}1.56$
Shell thickness	$0.291^{a\pm}0.004$	$0.292^{a\pm}0.006$
Egg colour	Brown	Brown
Fertility (%)	$90.23^{a\pm}2.34$	$91.62^{a\pm}2.79$
Hatchability (%) (TES)	$85.53^{a\pm}2.57$	$86.87^{a\pm}2.35$
Hatchability (%) (FES)	$90.79^{a\pm}2.23$	$92.22^{a\pm}2.72$
Survivability (%)	$97.54^{a\pm}2.23$	$95.70^{a\pm}2.48$

Means with different superscripts within a row are significantly different from each trait ($P < 0.05$).

RESULTS AND DISCUSSION

Mean and standard error of various traits of Kamrupa chicken are presented in Table 1.

Body weight: Chickens' body weight (combined sex) reared under intensive rearing system weighed significantly higher ($P< 0.05$) than birds of free range at all the stages of growth (Table 1). The results were expected because the birds under intensive rearing system were fed with balanced ration and provided with standard managemental practices. Similarly, Mizoram and Nicobari native fowl's live body weight reared under intensive system were higher than the traditional system (Sharma 1995, Chatterjee *et al.* 2002, Doley *et al.* 2009). Almost similar findings were also reported by Buragohain *et al*. (2006) in Vanaraja chicken in high altitude areas of Arunachal Pradesh.

Confirmation traits: The shank length, keel length and breast angle (combined sex) were recorded as 3.98±0.64 cm, 3.21±0.25 cm and 63.75±2.23 degree in intensive system and 4.31±0.98 cm, 3.88±0.76 cm and 62.35±2.54 degree in free range system, respectively. There were no significant differences between the confirmation traits in both the systems of rearing. In comparison to these 3 conformation traits, Rajkumar *et al*. (2012) and Jayalakshmi *et al.* (2009) recorded higher shank length and breast angle in Grampriya bird and commercial broilers respectively at similar age with the present study.

Age at sexual maturity: The female birds' average age at sexual maturity reared under intensive system (164.54±3.76 d) was shorter than the free range system (185.37±4.61 d). Kamrupa chicken's onset of sexual maturity was close to 161±1.67 days in Vanaraja chicken kept under deep litter management system (Jha *et al.* 2012).

Egg production and egg weight: Annual egg production was recorded higher in intensive rearing system (145.87±3.56) than the free range system (125.47±3.96). The annual egg production was higher than Vanaraja bird reared under extensive system at 3 altitudes in Nagaland (Zuyie *et al.* (2009). The egg shell colour of both the system was brown.

The egg weight at 32 and 40 weeks were recorded as 44.97 g±1.74 and 55.20 g±1.96 in intensive and 43.27 g±1.67 and 52.54 g±1.72 in free range system of rearing, respectively. No significant differences of egg weight at

both the age in intensive and free range system of rearing is found. However, Sharma and Hazary (2002) reported the egg weight from 42–44 g in 40 weeks of age in Vanaraja birds.

Egg quality traits: Egg shape index estimated as 75.23±3.54% and 76.43±3.74% in intensive and free range system, respectively. Similarly, Niranjan *et al.* (2008) estimated the shape index as 76.10 at 32 weeks of age in Vanaraja birds. Chatterjee *et al.* (2006) observed the shape index for IWI as 73.77±3.08 and IWH as 72.62±7.56 in two strains of white Leghorn.

The albumin index was recorded as 0.083±0.001 and 0.084±0.001 in intensive and free range system, respectively. The present finding was slightly lower than white Nicobari chicken of 0.0985±0.01 (Padhi *et al.* 1998) Uttar Pradesh chickens of 0.085±0.005 (Yadav *et al.* 2009) reared under backyard system. Yolk index which indicates the quality of egg was recorded as 0.401±0.009 and 0.403±0.008 in intensive and free range system, respectively which was close to Yadav *et al.* (2009) whose reported value was 0.395±0.008 in the chickens reared under backyard system.

According to Haunchi *et al.* (2009), the average albumin and yolk index (%) value in improved varieties is higher than indigenous breed. A similar trend also seen in Kamrupa bird which is an improved variety over theis indigenous.

Haugh unit of eggs from intensive rearing system (78.44±1.37) were slightly lower than the free range system (79.24±1.56). These values were higher than the findings of Yadav *et al.* (2009).

Shell thickness was found 0.291±0.004 and 0.292±0.006 in intensive and free range system, respectively. Slightly higher shell thickness in free range may be due to better mineral content of the different inputs the bird had eaten during scavenging in free range which otherwise the birds of the extensive system were not exposed to that situation.

The shell thickness was close to indigenous chicken of North Eastern India (Doley, 2006) and Vanaraja bird (Wani *et al.* 2007) under different management systems. Shell thickness is affected by environmental temperature, age of the bird and its genetic constitution (Sachdev *et al.* 2011). There was not any significant difference between the egg quality traits in both the systems.

Fertility and hatchability: The fertility percentage was slightly lower for intensive system (Table 1). Similarly, the hatchability percentage ranged from 85.53±2.57 to 92.22±2.72 in both the systems of rearing. However, Sheikh *et al.* (2006) recorded a lower value for fertility and hatchability than the present study in a flock of Vanaraja chicken.

Survivability: In intensive system, the survivability was 97.54±2.23 which is higher than the free range system (95.70±2.48). Similarly, Zuyie *et al.* (2009) reported that the mortality rate was 3.95±0.65% irrespective of 3 different altitudes in Nagaland under extensive system of rearing. On the other hand, in a study it was observed that the mortality during growing and laying periods in egg type chicken is influenced by the farm location (Pruthi *et al.* 1994).

Carcass characteristics: In the present study, the record on carcass characteristics of Kamrupa birds are presented in table 2. There was a significant difference between all the traits in both the systems excepts the dressing and eviscerated percentage. Similarly, Reddy and Rajaravindra (2013) recorded the slaughter parameters like carcass weight, breast weight, back weight, wing weight, and neck weight as percentage of pre-slaughter weight as 56.74, 14.05, 10.94, 5.28 and 2.95, respectively.

Economics: The cost of production of Kamrupa birds was estimated at prevailing market rate. All inputs and income generated are presented in Tables 3, 4. The cost of production per bird ranged from ₹ 638.00 (extensive system) to ₹ 1,156.25 (intensive system). Chatterjee *et al.* (2002) reported that birds kept under backyard farming system were comparatively cheaper than intensive systems. The higher cost of production in intensive system is due to good feed quality and quantity provided to birds. The live body weight and dressed body weight of birds reared under intensive rearing system was heavier than birds reared in free range (Table 2). In addition, total income per bird incurred was higher from intensive rearing system (₹ 1, 283.00) than the free range (₹ 775.00). However, the net profit per bird from intensive rearing system was (₹ 126.75) slightly lower than the free range (₹ 137.00). Thanaseelan and Arulnathan (2012) estimated a net return of ₹ 25/bird in desi chicken farming under intensive production system. The lower values in respect of net return compared to present study may be due to rearing of indigenous chicken in intensive system, where the productivity of the indigenous chicken are comparatively lower than its input consumption. Likewise, in a study on Vanaraja bird, Kumerasan *et al.* (2006) observed that the Vanaraja bird's performance improved considerably and is economical under intensive system.

Table 2. Carcass characteristics of Kamrupa bird at market age (combined sex)

Traits	Values (in intensive system)	Values (in free range system)
Live weight (g)	1800.60 ^{a}±170.78	1550.20 ^{b}±182.28
Dressed weight (g)	1363.12 ^{a}±141.63	1177.91 ^{b}±162.43
Dressing percentage	75.70 ^{a}±4.06	75.98 ^{a}±4.10
Eviscerated weight (g)	1270.20 ^{a}±170.04	1110.86 ^{b}±159.05
Eviscerated percentage	70.54 ^{a}±3.21	71.66 ^{a}±3.20
Breast weight (g)	332.61 ^{a}±23.84	279.49 ^{b}±25.78
Back weight (g)	303.90 ^{a}±21.47	263.48 ^{b}±22.19
Wings weight (g)	123.32 ^{a}±17.64	109.52 ^{b}±16.85
Drumstick weight (g)	165.122 ^{a}±28.43	144.24 ^{b}±25.23
Thigh weight (g)	173.86 ^{a}±20.15	155.73 ^{b}±20.17
Neck weight (g)	92.86 ^{a}±21.66	84.81 ^{b}±22.36
Giblet weight (g)	78.52 ^{a}±4.47	73.04 ^{b}±3.87

Means with different superscripts within a row are significantly different from each trait ($P < 0.05$).

Table 3. Cost of production per bird under intensive system of management (₹)

Items	Kamrupa bird (Intensive)
A. *Non-recurring expenditure*	
Land	Existing
Construction of poultry shed	400
Equipments	15
Total Non recurring Expenditure	415
B. *Recurring expenditure*	
Cost of day old chick	22
Cost of feed @ ₹19.00/kg (55 kg feed/bird)	1045
Cost of medicines and vaccines	21
Cost of labour, electricity, litter etc.	20
Miscellaneous expenditure	6
Total recurring expenditure (R)	1114
C. *Income*	
Sale of eggs @₹ 6/ egg (158 eggs/bird)	948
Sale of live birds @ ₹150/kg (Av. 2 kg/bird),	25
Sale of litter @ ₹25/qtl.	300
Sale of gunny bags @ ₹ 10/bag	10
Total income (I)	1283
D. *Depreciation*	
Poultry sheds @ 10 %/year	40
Equipments @ 15%/year	2.25
Total depreciation (D)	42.25
E. Total cost of production (R+D)	1156.25
F. Net profit/ loss [I- (R +D)]	126.75

Table 4. Cost of production per bird under extensive system of management (₹)

Items	Kamrupa bird (Extensive)
A. *Non-recurring expenditure*	
Land	Existing
Construction of poultry shed	150
Equipments	15
Total non recurring expenditure	165
B. *Recurring expenditure*	
Cost of day old chick	22
Cost of feed rice polish 1kg/day @ ₹13.00/kg and broken rice 1kg/day @ ₹ 16.00/kg. (Considering 20% mortality and 50% sex ratio)	529.25
Cost of medicines and vaccines	21
Cost of labour, electricity, litter etc.	20
Miscellaneous expenditure	6
Total recurring expenditure (R)	598.25
C. *Income*	
Sale of eggs @₹ 5/ egg (129 eggs/bird)	645
Sale of live birds @ ₹ 100/kg (Av. 1.3 kg/bird),	130
Sale of litter	–
Sale of gunny bags	–
Total income (I)	775
D. *Depreciation*	
Poultry sheds @ 25 %/year	37.5
Equipments @ 15%/year	2.25
Total depreciation (D)	39.75
E. Total cost of production (R+D)	638
F. Net profit/ loss [I- (R +D)]	137

From the above study, it can be concluded that Kamrupa bird can be economically reared in free range system of management as they perform well under low input system. However, from the net return of Kamrupa bird (Table 3 and 4) it can be concluded that they can be also reared economically under intensive and semi intensive system.

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