Comparative performances of improved poultry varieties under backyard rearing system in Dhemaji district of Assam

Abstract

Productive and reproductive performances in terms of body weight, age at first egg, egg production, egg weight, fertility, hatchability and mortality of *Vanaraja*, Rainbow Rooster, *Kamruapa* and *Desi* chicken of Assam were studied under traditional backyard system of rearing. The *Vanaraja*, Rainbow Rooster and *Kamruapa* birds were given to rear under the frontline demonstration programmes of the Krishi Vigyan Kendra, Dhemaji to the women farmers of the district during 2020-21. The data on bird weights at different ages, egg weights, fertility, hatchability as well as mortality were collected and recorded and compared among the varieties. The data recorded from the study were analyzed as per standard statistical methods. The overall mean body weights were significantly ($P < 0.05$) higher in all the improved varieties than *Desi* chicken at different ages. There is also significant ($P < 0.05$) difference of age at first egg among *Vanaraja* (182.05±5.52 days), Rainbow Rooster (175.08 ±6.13 days), *Kamruapa* (163.06±5.52 days) and *Desi* chicken (203.31±3.31 days). The mean egg production values up to 32, 40, 52 and 72 weeks of age in the demonstrated varieties were significantly ($P < 0.05$) higher than the corresponding values of *Desi* birds. The mean egg weights of *Vanaraja*, Rainbow Rooster, *Kamruapa* at 32, 40 and 52 weeks of age were also significantly ($P < 0.05$) higher than *Desi* birds. However, no significant difference was observed in mortality rates among the four groups at different ages. There was also no significant ($P < 0.05$) difference in fertility and hatchability percent among the four genetic groups. It is concluded that *Vanaraja*, Rainbow Rooster and *Kamruapa* birds are adapted well under traditional backyard rearing system in agro-climatic conditions of Dhemaji district of Assam with adequate economic advantages advantageous over the Indigenous birds.

Keywords: *Vanaraja*, *Kamrupa*, Rainbow Rooster, *Desi* chicken, backyard system of rearing, egg production, hatchability.

Introduction:

Poultry is one of the fastest growing segments of the agricultural sector of India. The broiler sector has been growing at around 8-10% per year while the layer sector has been growing at the rate of 6-7% in the year, 2021-22 [1] against the agricultural growth rate of 3% per in the same year [2]. The egg production of our country was 129.60 billion while the poultry meat production was 4.78 million ton (51.44% of total meat production) during 2021-22, occupying 3th and 5th positions, respectively in the world [3]. In India, the total egg production from commercial poultry is 109.93 billion while from the backyard poultry is 19.67 billion, contributing 84.82% and 15.18% of total production of egg, respectively. Still, the per capita availability of eggs is only 95 nos. against a requirement of 182 eggs as per the Indian Council of Medical Research (ICMR) recommendation, hence, a big gap exists between the requirement and availability of egg. Majority of egg production in India is from the organized commercial poultry farms while the backyard poultry is contributing about 19.21 billion eggs, which is about 16.80% of the total egg production [4]. In Assam, more than 97% of the chickens are reared under backyard system and the indigenous chicken of the state is producing around 388.66 millions eggs, which is 95.35% of the total egg production of the state [5]. Thus, the indigenous chicken plays very significant role in livelihood of rural farmers and also important for meeting the nutritional security of the rural masses in India. Traditionally, the indigenous varieties of chickens of different locations used for backyard rearing are very low in production potential, which is around 70-80 numbers of eggs/ year and 1.30 – 1.50 kg live weight at about one year of age. The low productivity of native indigenous fowls is mainly due to their inherent low genetic potential, thus making the backyard poultry less remunerative. Therefore, to meet the growing demands of increasing human populations and to enhance the *per capita* consumption of eggs and meat among rural people, poultry farming in their backyard with improved varieties of poultry is one of the available alternatives. *Vanaraja*, *Kamrupa* and Rainbow Rooster are three such dual purpose multi-coloured, low input improved poultry varieties developed by Directorate of Poultry Research, Hyderabad; All India Coordinated Research Project (AICRP) on Poultry, AAU, Khanapara and Inbro Research and Breeding Farm, Bangaluru, respectively. However, information on systemic studies about the productive and reproductive performances of such varieties of birds under backyard system in Assam is very scanty. Keeping these facts in mind and to strengthen the rural poultry and to increase the farmers' income demonstrations were planned with these three types of chicken as backyard farming to assess various economic traits

under Frontline Demonstration (FLD) programmes of Krishi Vigyan Kendra (KVK), Dhemaji under agro-climatic conditions of Dhemaji district in comparison to their local counterpart in backyard rearing condition.

Materials and methods:

The present study was conducted during the period spreading January, 2020 to November, 2021 by Krishi Vigyan Kendra, Dhemaji in Dhemaji district under Frontline Demonstration (FLD) Programmes of the Animal Science Discipline. For the programme 36 numbers of women farmers were selected randomly from different villages of Sissiborgaon and Dhemaji Development blocks. They were divided into 3 groups of 12 women and each of the twelve farm-women of the groups were given 15 numbers of month-old *Vanaraja, Kamrupa* and Rainbow Rooster varieties of birds. The main criteria for selection of the farm women was their experience on rearing indigenous poultry and having a minimum of 15 numbers of *desi* birds (native to the district) of same age in their house. Thus a total of 180 nos. of each of *Vanaraja, Kamrupa* and *Rainbow* Rooster were distributed under the FLD programmes. *Vanaraja* and Rainbow Rooster birds were procured from the private chick dealer based at Guwahati and *Kamrupa* birds were taken from the Directorate of Research (Veterinary), College of Veterinary Science, Assam Agricultural University, Khanapara, Guwahati. Each of the farm women was given 13 female and 2 male birds of the respective breeds for rearing under backyard system like their local counterparts.

The body weights of all the birds were taken before distribution to the farmers and also at monthly intervals up to maturity at an average age of six month. The average age at the point of lay, mean egg production and egg weights were recorded at 32, 40, 52 and 72 weeks of age for all the birds of three varieties and the indigenous birds at respective farmers' house. Vaccination against *Ranikhet* (F1 and R2B strain of RD) and *Gumboru* (IBD) disease were done in all the birds and health status of the birds was monitored regularly throughout the period. Birds of all the varieties were reared in the farmers' backyard under same feeding and managemental conditions. The mortality rates of birds at 6^{th} to 30^{th} and 31^{st} to 52^{nd} week age, fertility and hatchability percentage of eggs were also recorded for a period of one and half year.

The data recorded from the study were analyzed as per the methods described by Snedecor and Cochran, 1994 [6]. The effect of genetic groups on the different growth and production traits were analyzed. The individual means among genetic groups were tested by Duncan's Multiple Range Test (DMRT) for their significance.

Results and discussions:

The overall mean body weights of *Vanaraja*, Rainbow Rooster and *Kamrupa* birds at 2, 3, 4, 5 and 6 months of age were recorded as 813.67±15.77, 1308.08±19.72, 1750.50±27.93, 2122.25±45.26 and 2566.00±59.05; 639.83±12.65, 980.00±15.32, 1204.00±20.57, 1591.50±34.09 and 2111.42±34.51 and 408.17±5.14, 608.42±12.45, 789.00±10.56, 1018.00±7.50 and 1337.00±10.49 g respectively, whereas the average body weights of indigenous birds at their respective age were 370.42±3.56, 495.50±5.07, 638.67±5.95, 792.25±7.76 and 1062.67±12.60 g, respectively under traditional system of management (Table1). The body weights of *Vanaraja*, Rainbow Rooster and *Kamrupa* birds at different ages were found to be significantly ($P < 0.05$) higher than their corresponding values for Indigenous chicken, which might be due to the difference in genetic makeup of the birds. Islam *et al.* (2014) [7] also reported a comparable body weights at 8 and 20 weeks of age in case of *Vanaraja* and indigenous chicken in Assam. Significantly higher body weights of *Vanaraja* birds at different ages were also observed by Saikia *et al.* (2017) [8]. Sarma et al. (2020) [9] reported that the average body weights in *Vanaraja* birds were significantly ($P<0.05$) higher followed by *Kamrupa* and *Desi* in similar ages. Kalita *et al.*, (2016) [10] also observed similar body weight trends in Kamrupa with ages under similar condition. Deka *et al.* (2014) [11] recorded much lower mean body weights in *Vanaraja* and almost similar mean body weight in indigenous chickens at 24 weeks of age. The higher body weights recorded in the present study might be due to the higher access of nutrients during the study period and superior germplasm of the improved birds.

Table1. Monthly mean (±SE) body weights (g) of different varieties of birds under backyard system of rearing

Age (month)	Sex	Varieties of poultry				P-values
		Vanaraja	Rainbow Rooster	*Kamrupa*	Indigenous	
1	Male	355.33 ±7.43	330.33 ±5.89	262.00 ±8.01	207.33 ±3.70	
	Female	305.33	285.83	200.67	186.83	

		±2.87	±4.63	±4.14	±3.08	
	Overall	330.33[a] ±5.12	308.083[b] ±4.71	231.33[c] ±5.99	197.08[d] ±2.74	3.69006E-59
	Male	928.83 ±8.62	725.00 ±9.50	429.00 ±7.78	385.67 ±4.33	
	Female	698.50 ±4.83	554.67 ±7.76	387.33 ±4.15	355.17 ±4.09	
2	Overall	813.67[a] ±15.77	639.83[b] ±12.65	408.17[c] ±5.14	370.42[d] ±3.56	1.02032E-90
	Male	1454.83 ±7.14	1078.33 ±12.53	685.67 ±12.84	523.50 ±4.95	
	Female	1161.33 ±6.82	881.67 ±11.43	531.17 ±7.36	467.50 ±5.10	
3	Overall	1308.08[a] ±19.72	980.00[b] ±15.32	608.42[c] ±12.45	495.50[d] ±5.07	7.1421E-116
	Male	1961.17 ±8.48	1355.67 ±8.51	836.33 ±12.75	675.17 ±5.19	
	Female	1539.83 ±6.41	1052.33 ±8.95	741.67 ±11.69	602.17 ±5.01	
4	Overall	1750.50[a] ±27.93	1204.00[b] ±20.57	789.00[c] ±10.56	638.67[d] ±5.95	2.4365E-119
	Male	2467.83 ±8.24	1847.67 ±9.60	1040.67 ±7.35	836.00 ±8.81	
	Female	1776.67 ±5.71	1335.33 ±10.50	995.33 ±11.82	748.50 ±5.97	
5	Overall	2122.25[a] ±45.26	1591.50[b] ±34.09	1018.00[c] ±7.50	792.25[d] ±7.76	2.72507E-95
	Male	3012.83 ±18.17	2365.50 ±13.07	1385.00 ±11.90	1143.33 ±12.53	
	Female	2119.17 ±9.47	1857.33 ±14.94	1289.00 ±12.15	982.00 ±6.33	
6	Overall	2566.00[a] ±59.05	2111.42[b] ±34.51	1337.00[c] ±10.49	1062.67[d] ±12.60	7.22177E-91

Means with different superscripts within rows differ significantly (p < 0.05)

The mean ages at the time of producing first egg were 182.05±5.52, 175.08 ±6.13, 163.06±5.52 and 203.31±3.31 days in *Vanaraja*, Rainbow Rooster, *Kamrupa* and Indigenous chicken, respectively (Table 2). The significantly ($p < 0.05$) lower age at first egg in case of all the improved varieties might be due to the superiority in germplasm and nutritional status of the birds. Islam *et al.* (2014) [7] and Sarma *et al.* (2020) [9] also recorded the similar findings in *Vanaraja* and indigenous chicken of Assam under backyard system. The present findings were also comparable with the findings of Zuyie *et al.* (2009) [12], Deka *et al*. (2014) [11] and Saikia *et al*. (2017) [8] for *Vanaraja* birds. In contrast to the findings, Pathak & Nath (2013) [15] recorded much lower values for *Vanaraja* and *Desi* chicken in Sikkim. The differences in the age

at first egg recorded here might be due to the better management and nutrition as well as higher genetic makeup of the demonstrated birds over indigenous flock. The mean egg production values up to 32, 40, 52 and 72 weeks of age in *Vanaraja*, Rainbow Rooster and *Kamrupa* birds were significantly ($P < 0.05$) higher than the corresponding values of Indigenous birds, which was also supported by the findings of Islam *et al*. (2014) [7], Saikia *et al*. (2017) [8], Sarma *et al.* (2020) [9] and Kumaresan *et al*. (2008) [14] in case of *Vanaraja* birds compared to Native birds. However, Kumar *et al.* (2005) [15] reported a low average egg production of 147 eggs per *Vanaraja* hen per annum under traditional system in Manipur. Very low annual egg production in Indigenous birds might be due to long pause between two clutches governed by its genetic characteristics leading to broodiness of these birds in those pauses.

Table2. Productive and reproductive parameters of *Vanaraja*, Rainbow Rooster, *Kamrupa* and *Desi* birds

Particulars	**Bird varieties**				**Changes over *Desi* birds**		
	Vanaraja	**Rainbow Rooster**	***Kamrupa***	***Desi* birds**	***Vanaraja***	**Rainbow Rooster**	***Kamrupa***
Mature hen wt. (g)	2119.17[a] ±9.47	1857.33[b] ±14.94	1489.00[c] ±12.15	1365.53[d] ±21.43	55.19 % increased	36.02 % increased	9.04 % increased
Age at first egg (days)	182.05[a] ±5.52	175.08[a] ±6.13	163.06[b] ±5.52	203.31[c] ±3.31	10.46 % decreased	13.89 % decreased	19.80 % decreased
Mean egg production							
Up to 32 wk of age	23.13[a] ±1.34	21.31[a] ±1.25	26.55[a] ±2.01	11.45[b] ±0.32	102 % increased	86 % increased	132 % increased
Up to 40 wk of age	48.05[a] ±1.32	47.64[a] ±2.44	52.23[a] ±2.13	26.72[b] ±1.81b	79 % increased	78 % increased	95 % increased
Up to 52 wk of age	89.29[a] ±1.02	86.84[a] ±2.40	95.12[a] ±2.52	43.35[b] ±2.32	106 % increased	100 % increased	119 % increased
Up to 72 wk of age	162.12[a] ±1.53	160.46[a] ±267	182.41[a] ±2.25	76.27[b] ±0.85	112 % increased	110 % increased	139 % increased
Mean Egg weight (g)							
Up to 32 wk of age	46.13[a] ±1.11	45.43[a] ±2.02	45.61[a] ±2.24	36.92[b] ±1.32	25 % increased	23 % increased	23 % increased
Up to 40 wk of age	53.16[a] ±1.33	52.6[a] ±2.11	52.87[a] ±2.16	43.26[b] ±1.88	22 % increased	21 % increased	22 % increased
Up to 52 wk of age	57.24[a] ±2.22	56.12[a] ±3201	56.02[a] ±2.17	46.52[b] ±2.11	23 % increased	20 % increased	20 % increased
Survivability (%)							
0 to 5th week	90.74±1.01	90.12±2.21	92.43±2.14	93.93±1.05			
6th to 30th week	95.15±1.02	93.23±2.42	97.01±1.52	98.45±1.26			
31st to 52nd week	97.43±1.28	95.56±1.41	98.02±1.78	99.42±0.58			

Fertility(%)	91.13±2.95	91.23±2.78	92.03±2.45	92.67±3.79	
Hatchability (%) on TES	85.14±3.45	84.24±2.95	85.89±3.03	88.39±3.23	

Means with different superscripts within a row differ significantly (p < 0.05)

The mean egg weights of the four genetic groups at 32, 40 and 52 weeks of age are presented in the Table 2. There is significant ($p < 0.05$) difference among the values at different ages. The lower values might be due to inferior genetic makeup in indigenous chicken of Assam. The findings were also corroborated with the findings of Islam *et al.* (2014) [7], Sarma *et al.* (2020) and Saikia *et al.* (2017) [8]. Kalita *et al.* (2012) [16] also recorded the mean egg weight as 35.27±0.15 g in case of indigenous chicken of Assam. Further, the present findings of *Vanaraja* are comparable with the findings of Kumar *et al.* (2005) [15], who reported that the average egg weight of 58 g under traditional rearing system in Manipur. There were no significant ($p < 0.05$) difference in survivability among the genetic groups at different ages. The findings were also supported by the findings of Islam *et al.* (2014) [7] and Saikia *et al.* (2017) [8]. The main cause of mortality during early part of their life were cold climate, yolk sac infection *etc*. The percent mortality pattern was almost similar in all four types of birds as with the advancement of age, which was in decreasing trend. No significant difference was observed in respect of survivability among four varieties of birds, which might be due to better resistance to the diseases with advancement of age. Islam *et al.* (2014) [7] also reported similar trends of mortality in *Vanaraja* and indigenous chicken of Assam. The values for fertility (%) and hatchability (%) on total egg set (TES) recorded in case of *Desi* birds were higher than the *Vanaraja* birds. However, there was no significant difference in fertility and hatchability of the eggs of *Vanaraja* and indigenous birds. Almost similar types of findings were also reported by Kalita *et al.* (2012) [16] and Saikia *et al.* (2017) [8].

Conclusion:

The mature hen weights, age at laying first egg, annual egg production as well as the egg weights of the chicken varieties- *Vanaraja*, Rainbow Rooster and *Kamrupa* revealed that rearing them in backyard traditional system in Dhemaji district is advantageous over the Indigenous birds. The egg colour of all these birds is brown like the egg colour of local birds and the rearers get same price as in case of local or organic eggs in the markets. Thus, the study revealed that the

improved chicken varieties viz. *Vanaraja*, Rainbow Rooster and *Kamrupa* were adapted well under traditional backyard rearing system in the agro-climatic conditions in Dhemaji district of Assam with adequate economic advantages.

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