



Comparative performance evaluation of Dahlem Red, native and their crosses under intensive management in Himachal Pradesh

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Received: 3 November 2020; Accepted: 16 August 2021

Keywords: Dahlem Red, Native, DND cross, DN cross, Himachal Pradesh

Backyard poultry farming is one of the allied agriculture activity having great potential in prevalent mixed farming system of hills. This system of bird rearing helps to improve income and nutritional security of marginal, landless and resource poor farmers (Padhi 2016). Poultry production in Himachal Pradesh has witnessed slower growth due to sluggish growth of organized commercial poultry. The stagnant per capita egg availability of 14 eggs/annum is far less than national average of 79 eggs/annum. Backyard poultry farming has gained recognition among farming community of the state to meet local requirement of eggs and poultry meat. As a result, total poultry population in state grew by 21.46% during 2012-19 and stood at 1.341 million birds (BAHS 2019).

This system of rural poultry rearing has great potential to generate highly nutritious food items at minimal cost (Alders *et al.* 2009, Pica-ciamarra and Otte 2010). The state has high and increasing local demands for eggs and poultry meat which is being largely fulfilled by supplies from adjoining states at comparatively high prices (Dinesh *et al.* 2020). Backyard poultry production is a handy enterprise with low cost initial investment to improve the socio-economic status of the farmers along with guarantee for improving protein deficiencies among the poor. Traditionally native chicken used for backyard poultry production has low production potential of around 70 to 80 eggs per year, thus making the backyard poultry less economical. Lack of availability of superior stock has been a major constraint in backyard poultry farming in hills of Himachal Pradesh (Sankhyan *et al.* 2013, Thakur *et al.* 2014). Genetic improvement in local stock may be time consuming but the improvement will be permanent (Dinesh *et al.* 2018). Therefore efforts had been made under AICRP on Poultry Breeding at Palampur centre funded by ICAR. These efforts involved crossbreeding experiment using Dahlem Red and indigenous chickens to determine the

growth and production performance of crosses at various ages. Growth and production traits of a bird indicate its genetic constitution and adaptation with respect to the specific environment (Ahmad and Singh 2007). The knowledge of performance of economic traits helps in designing the selection and breeding programme for further improvement. Since little information exists on production characteristics of Dahlem Red (DR), Native (N) and their crosses, hence the present study was carried out to evaluate the DR, Native, DN and DND crosses for their growth and production traits, and their suitability for backyard poultry production in the state.

Growth and production data for the present study were collected from the performance records maintained at Poultry Farm, Palampur under AICRP on Poultry Breeding. Performance data of 300 birds each of Dahlem Red (DR), Native (N), cross of Dahlem Red and Native (DN) and DND (F₂ generation) were utilized for the present study.

Dahlem Red is an egg-purpose breed of chickens, imported from Germany to India. It is a red-feathered breed laying brown tinted eggs with good egg weight and known for its high disease tolerance and immune competence (Kundu *et al.* 1999). This breed is used to produce improved germplasm suitable for backyard rearing in India. DR birds were procured from Central Poultry Development Organisation, Chandigarh, whereas native birds were purchased from farmers of Himachal Pradesh and further reproduced through selective breeding. DR and Native birds were subsequently utilized in cross breeding programme for production of DN and DND (*Himsamridhi*) crosses. DN cross were developed by crossing DR with native (DN, 50% DR inheritance) and DND crosses were developed by crossing DN male (F₁) with DR female to produce DND (75% DR inheritance) crosses.

All chicks were brooded up to six weeks of age and thereafter transferred in floor pens on deep litter system for a period of 72 weeks. The birds were provided starter feed up to 0-6 week, grower feed 7-18 week and layer feed 18 week onwards. All the chicks were immunized against Ranikhet disease by using F1 and Lasota strain on 7th and 28th days respectively. Gumboro (IBD) disease vaccine was

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administered on 13th and 24th days by using intermediate strain. Other vaccination and deworming schedule were followed up to 72 weeks of age as per Chauhan and Roy (2003).

The performance traits evaluated were growth traits, viz. (chick weight at day old stage, body weight at 4 week, 8 week, 12 week, 20 week and 40 week), age at sexual maturity (ASM), hen housed egg production (HHEP), hen day egg production (HDEP) and survivor egg production (SEP) at 40 weeks, 52 weeks and 72 weeks of age, and egg weight at 28, 40 and 52 weeks of age. The phenotypic means and variability for different traits was estimated among different stocks. The data was analyzed by SPSS 24 software package. The effect of genetic group on the different growth and production trait were studied.

The phenotypic mean estimated for performance traits of DR, Desi, DN and DND for growth traits, viz. (day-old chick weight, body weight at 4 week, 8 week, 12 week, 20 week and 40 week), age at sexual maturity (ASM), hen housed egg production (HHEP), hen day egg production (HDEP) and survivor egg production (SEP) at 40, 52 and 72 weeks of age and egg weight at 28 weeks, 40 weeks and 52 weeks of age are presented in Table 1.

Body weight of DR birds differed significantly ($p < 0.05$) from native birds at all ages except at 20 weeks. The body weights of crosses were significantly higher than native birds and had body weight nearly similar to DR birds. However, there was significant variation in day-old chick and 8 week body weight. Among crosses, body weight of DN and DND did not differ significantly at day old stage, 8 week, 20 week and 40 week. However, at 4 week and 12 week of age, there was significant variation in body weight of DN and DND crosses, and DND birds had higher body weight than DN birds. Among all stocks, body weight of Dahlem Red bird was higher than Desi, DN and DND stocks except at 20 week. Body weight is the direct reflection of growth and it influences the production and reproduction trait of birds (Niranjan *et al.* 2008). The significant effect of genetic group on body weight of chicken was reported by many workers (Mohammed *et al.* 2005, Chatterjee *et al.* 2007). The lower body weight of local Desi birds was on expected line since indigenous chicken are known to have lighter and compact body weight to escape from the predators in free range system of rearing (Haunshi *et al.* 2009). Body weight estimated in the present study was consistent with report of Jha *et al.* (2013) who reported almost similar body weight for DR, native and DN cross. Alireza *et al.* (2015) observed the average weight of native hen and rooster pullets in Isfahan Province at ages of 8, 12 and 24 week as 671 ± 109 and 853 ± 125 , 929 ± 177 and 1199 ± 237 , 1765 ± 363 and 2167 ± 335 g which were higher than the present findings. Sarma *et al.* (2018) recorded the body weight of Desi, Vanaraja and Srinidhi birds under field condition and reported lower body weight for desi birds at 8 (368.12 ± 2.74), 20 (789.14 ± 5.03), 40 (1269.31 ± 9.01) and 52 (198.31 ± 2.03) weeks of age in contrast to present study.

Significant variation in sexual maturity among different

Table 1. Growth and production performance of DR, Native, DN and DND crosses at different period of age

	Dahlem Red	Native	DN	DND
<i>Body weight</i>				
Day old	36.93 $\pm$ 0.36 ^a	30.62 $\pm$ 0.18 ^b	35.25 $\pm$ 0.20 ^c	34.75 $\pm$ 0.30 ^c
4 weeks	237.27 $\pm$ 2.75 ^a	185.33 $\pm$ 1.09 ^b	230.50 $\pm$ 6.25 ^{ac}	250.20 $\pm$ 4.20 ^{ad}
8 weeks	625.65 $\pm$ 13.73 ^a	500.53 $\pm$ 11.90 ^b	560.90 $\pm$ 14.17 ^c	550.20 $\pm$ 8.66 ^c
12 weeks	975.84 $\pm$ 11.43 ^a	834.15 $\pm$ 19.74 ^b	865.0 $\pm$ 32.16 ^b	955.36 $\pm$ 20.50 ^a
20 weeks	1465.39 $\pm$ 19.73 ^a	1420.30 $\pm$ 20.25 ^a	1510.20 $\pm$ 15.40 ^{ab}	1501.06 $\pm$ 15.20 ^{ab}
40 weeks	1627.76 $\pm$ 12.20 ^a	1515.20 $\pm$ 15.68 ^b	1602.25 $\pm$ 27.0 ^{ac}	1550.20 $\pm$ 14.25 ^{bc}
<i>Egg weight</i>				
28 weeks	49.25 $\pm$ 0.15 ^a	40.20 $\pm$ 0.10 ^b	48.50 $\pm$ 0.10 ^a	49.46 $\pm$ 0.50 ^a
40 weeks	52.35 $\pm$ 0.26 ^a	44.95 $\pm$ 0.20 ^b	51.30 $\pm$ 0.12 ^c	50.95 $\pm$ 0.20 ^c
52 weeks	54.71 $\pm$ 0.20 ^a	49.01 $\pm$ 0.15 ^b	53.70 $\pm$ 0.25 ^c	53.10 $\pm$ 0.15 ^c
<i>ASM</i>				
Age at first egg	136	154 ^a	160 ^c	140 ^d
25% HHEP	148	173 ^b	177 ^c	149 ^d
50% HHEP	169	193 ^b	185 ^c	170 ^d
<i>Egg production upto 40 weeks</i>				
HHEP	86.49 ^a	43.29 ^b	67.69 ^c	82.69 ^a
HDEP	88.32 ^a	44.75 ^b	69.45 ^c	83.23 ^a
SEP	90.35 ^a	46.42 ^b	70.36 ^c	84.60 ^a
<i>Egg production upto 52 weeks</i>				
HHEP	144.01 ^a	79.83 ^b	102.45 ^c	130.83 ^d
HDEP	148.35 ^a	84.58 ^b	105.72 ^c	133.03 ^d
SEP	152.50 ^a	87.71 ^b	107.92 ^c	140.38 ^d
<i>Egg production upto 72 weeks</i>				
HHEP	214.10 ^a	92.80 ^b	155.41 ^c	179.84
HDEP	225.27 ^a	101.40 ^b	166.95 ^c	192.20
SEP	236.35 ^a	105.95 ^b	194.88 ^c	206.80

Means bearing same superscript with in rows did not differ significantly ($p < 0.05$).

groups of poultry birds was observed. DR matured at the age of 136 days, Desi at 154 days and their crosses DN and DND at 160 and 140 days respectively. The DR and DND started laying earlier compared to Native and DN. Age at sexual maturity was lowest in DR birds (136 days). The lower age at sexual maturity in the layer is desirable, which may lead to the increase laying period and improving the egg production. Significant variation was also observed for 25% and 50% HHEP among all stocks. DR birds matured earlier than all the birds in present study and there was no significant variation for age at sexual maturity (ASM) in DR and DND birds. The early age of sexual maturity in DND birds compared to desi and DN may be because of genetic inheritance of Dahlem Red (75%) birds prevailing

in DND. Niranjana *et al.* (2008) reported 160.89 and 164.79 days in attaining sexual maturity for Gramapriya and Vanaraja birds in backyard farming. Haunshi *et al.* (2009) reported that there was comparatively higher age of sexual maturity in improved varieties namely Gramapriya (179.50 days) and Vanaraja birds (197.70 days), which were developed for backyard farming. Giri and Sahoo (2012) reported lower age of first lay (138 days in intensive system and 142 days in extensive system of management) in Gramapriya birds. In a comparative study, Jha *et al.* (2013) reported 143.65 days ASM in Dahlem Red, 171.38 days in Dahlem Red $\times$ Native cross and 212.43 days in Native birds.

Egg weight at 40 and 52 weeks of age significantly ($p < 0.05$) varied in crosses compared to native and DR birds. However, egg weight at 28 weeks of age did not differ significantly in DR and crosses. The egg weight of DR, Native, DN and DND crosses at 28 weeks were 49.25, 40.20, 48.50 and 49.46 g, egg weight at 52 weeks of age were 54.71, 49.01, 53.70 and 53.10 g respectively. Higher egg weight in crosses might be due to the paternal inheritance from Dahlem Red birds utilized in developing the crosses. Hen housed egg production, hen day egg production and survivor egg production at 40 weeks of age was significantly higher in DR and DND cross compared to Desi and DN cross. However, there was no significant variation in egg production of DR and DND cross at 40 week of age. The egg production at 52 weeks and at 72 weeks of age was investigated in the present study and it varied significantly among them. The egg production of DR birds was significantly higher than all the stocks throughout the laying cycle, whereas there was significant variation in egg production of DN and DND crosses. Higher egg production in DND cross might be due to 75% the paternal inheritance of Dahlem Red birds utilized in developing the crosses. Kalita *et al.* (2009) recorded lower egg production and egg weight for indigenous chicken up to 72 weeks of age as 65.30 ± 1.45 and 37.80 ± 0.65 g in tribal and 62.60 ± 1.56 and 38.69 ± 0.69 g in non-tribal communities of Assam. Haunshi *et al.* (2011) compared the Assel and Kadaknath breed of poultry and observed that the Aseel breed showed ($p < 0.01$) higher BW at different ages; greater egg weights at 28, 32 and 40 week of age than the Kadaknath breed. Whereas the Kadaknath breed reached sexual maturity at an early age and it had higher 40-wk egg production ($p < 0.01$).

In another study, Kalita *et al.* (2017) compared the performance evaluation of PB2 $\times$ indigenous and Dahlem Red birds under intensive system of rearing and reported delayed age at sexual maturity (ASM) (172.36 ± 5.26 days) in PB-2 $\times$ indigenous and 158.23 ± 2.75 days in Dahlem Red bird in comparison to present study. Egg production and egg weight at 40 and 52 weeks of age were recorded as 39.20, 39.64 ± 2.53 g and 70.23, 49.20 ± 1.25 g, respectively in PB-2 $\times$ Indigenous bird and 82.56, 48.60 ± 3.55 g and 124.76, 54.62 ± 2.73 g in Dahlem Red bird, respectively which is lower than the present findings. Shivaprasad *et al.* (2017) reported least squares mean of body weight at 4, 8,

20 and 40 weeks in DR bird were 146.88, 374.28, 1150.70 and 1678.57 g. He also reported age at sexual maturity (181.02 days), delayed than the present study, egg production up to 40 weeks of age (71.06 eggs) and higher egg weight at 32 and 40 weeks of age 52.81 and 56.25 g respectively. Yadav *et al.* (2017) reported annual egg production (81), average age at first laying (181 days), average egg weight (34.3 g), body weight at 8 weeks (542 g in male and 450 g in female), 885 g at 12 weeks in males and 772 g in females and at 72 weeks (1,800 g in males and 1,578 g in females) in Ankaleshwar breed of poultry.

ACKNOWLEDGEMENT

Authors acknowledge the support received from ICAR-DPR, Hyderabad through AICRP on Poultry Breeding.

SUMMARY

The present study compared the production performance of DR, Native, DN and DND crosses under intensive system of management. DN and DND crosses showed better growth and production performance compare to local Native parent birds. DND (75% DR inheritance) chicken performed better than DN cross (50% DR inheritance). The better performance of crosses indicated effective utilization and propagation under rural poultry farming system as low input technology birds. It is more beneficial to rear the crosses than local Native birds in Himachal Pradesh. Based on better performance of DND than DN, the former was recommended for development and propagation of *Himsamridhi*; location specific poultry variety. There is need for wider propagation of these birds in the state by development agencies. Future efforts are required for adaptability assessment of *Himsamridhi* birds in different agroclimatic region of the state under prevalent village poultry farming system. This will ascertain the suitability of developed cross at farmer's level.

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