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Estimation of Phenotypic Trend in Performance Traits of Native Chicken Germplasm of Himachal Pradesh

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ABSTRACT

Native chicken germplasm is playing an important role in development of location specific chicken stocks suitable for rural backyard poultry production. In the present study, on-farm performance evaluation for various growth, sexual maturity and egg production traits was done of native chicken population. First four generations of the native birds produced through selective breeding was evaluated. The performance traits evaluated were growth (Chick weight, 4th week BW, 8th week BW, 12th week BW, 20th week BW and 40th week BW), 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 weeks, 40 weeks and 52 weeks age. The phenotypic means and variability for different traits was estimated generation wise and the phenotypic time trend over the generations was estimated for various performance traits. The analysis revealed positive phenotypic trends in day old chick weight (0.70 g), 8 weeks BW (34.64 g), 12 weeks BW (63.80 g), 20th week body weight (25.01 g), negative trend in age at first egg (-4.8 days) and age at 25% HHEP (-3.5 days), positive trend in egg weight at 28-week (2.1 g), 40-week (1.5 g) and 52-week (0.4 g). The hen day egg production at 40 weeks, 52 weeks and 72 weeks of age showed positive phenotypic trend of 3.8, 6.1 and 2.3 eggs. Further, hen housed and survivor egg production also showed positive trend estimates at 40, 52 and 72 weeks age. Negative or declining trends were observed in growth traits *viz*. 4 weeks BW (-16.4 g) and 40 weeks BW (-55.45 g). The results of present analysis indicated the effectiveness of the selection along with improved management for bringing improvement in egg production traits of the population in succeeding generations.

Keywords: Native chicken, phenotypic trend. growth traits, egg production

Indigenous/native breeds of chickens are playing an important role in rural economies in most of the developing and underdeveloped countries. They play a major role for the rural poor and marginalized section of the people with respect to their subsidiary income and also provide them with nutritious egg and meat for their own consumption (Padhi, M.K. 2016). Native rural breeds are valuable genetic resources due to their adaptability to harsh conditions and resistance against local diseases. Although, the native birds are slow grower and low egg producer but they have other useful characteristics like attractive plumage color, lay brown shelled eggs, great preference for Desi egg, ability to escape from predators, excellent forager and resistance against local infectious diseases. The native breed chickens are the reservoir of genomes and major genes for improvement of high yielding exotic germplasm for tropical adaptability and disease resistance (Yadav *et al*., 2017). Low production under village farming system is compensated by higher price of egg and chicken meat However, performance of native fowl can be improved by change in husbandry, feeding, and better health cover. Genetic improvement may be made either through selection and crossbreeding or by utilization of both selection and crossbreeding. Improvement through selection may be time consuming but the improvement will be permanent. Through crossbreeding improvement may be faster but research has to aim for the production of native-type birds with higher production potential. Breeding of rural chicken is important for small farmers to produce more income and also to conserve genetic variation of native breeds. Though these birds are being used for rural backyard poultry production and little information exists on potential productivity and production characteristics of indigenous chickens. Hence, the present study is being carried out to evaluate the growth and production performance traits and to estimate the phenotypic trend of native chicken maintained at Poultry farm, Palampur.

MATERIAL AND METHODS

The birds (*Desi*) selected for the present study were procured from different regions of the statere presenting a random sample of native fowl germplasm. These birds were then reared under farm conditions and selected for phenotypic uniformity to develop pure lines (Reddish brown and Black). Purification, of native birds were done and developed for two phenotypes: Reddish brown and black. The black line was discarded and reddish brown type *desi* birds were evaluated on- farm for growth and production traits. Since then, four consecutive generations of native birds had been produced and evaluated on farm for various growth performance traits. The birds were maintained 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 onward.

Growth performance data for the present study is being collected from the performance records maintained at Poultry Farm, Palampur under AICRP on Poultry Breeding. The performance traits evaluated were growth traits (Chick weight at day old stage, 4^{th} week BW, 8^{th} week BW, 12^{th} week BW, 20^{th} week BW and 40^{th} week BW), 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 weeks, 40 weeks and 52 weeks of age. The phenotypic means and variability for different traits was estimated generation wise and the phenotypic time trends over the generations was estimated for various growth and performance traits.

Phenotypic trend per year was estimated as the linear regression of the population performance (P) on time (year).

$$\Delta P = b_{P.T} = \frac{\sum Pt}{\sum t^2}$$

Where,

$b_{P.T}$ = is regression of population performance (P) on time (t);

$\sum Pt$ = corrected sum of product for performance and time.

$$= \frac{\sum Pt - \sum P \sum t}{N}$$

$\sum P^2$ = corrected sum of square of performance (trait)

$$= \frac{\sum P^2 - \left(\sum P\right)^2}{N}$$

$\sum t^2$ = corrected sum of square for time taken as deviation from its means

$$= \frac{\sum t^2 - \left(\sum t\right)^2}{N}$$

N = Total number of records

RESULTS AND DISCUSSION

The phenotypic mean estimated for growth performance traits viz. growth (Chick weight, 4^{th} week BW, 8^{th} week BW, 12^{th} week BW, 20^{th} week BW and 40^{th} week BW), 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 weeks, 40 weeks and 52 weeks of age were presented in table 1. In Growth traits Chick weight, 4^{th} week BW, 8^{th} week BW, 12^{th} week BW and 20^{th} week BW were higher in 4^{th} generation whereas 40^{th} week BW were found maximum in first generation, which might be due to negative correlation between body weight and egg production.. Age at sexual maturity (age at first egg, age at 25% HHEP and age at 50% HHEP) is observed least in 3^{rd} generation which is desirable. Egg production up to 40 weeks i.e. HHEP, HDEP and survivor egg production is higher in G3 generation followed by G4, G2 and G1. Similar results were observed in egg production up to 52 weeks. Egg production up to 72 weeks is more in fourth generation.

Niranjan *et al.* (2008) compared the growth and production performance of 4 chicken varieties developed for backyard farming. The body weights were significantly ($p<0.05$)

Table 1: Performance of Native birds over different generation under farm conditions

	G1	G2	G3	G4
Body Weight	**Mean ± SE**	**Mean ± SE**	**Mean ± SE**	**Mean ± SE**
Day old	29.14±0.06	28.84±0.07	29.95 ± 0.24	31.29±0.46
4 weeks	188 ± 1.79	194.65±1.24	184.36 ± 1.70	189.04±1.52
8 weeks	-----	----	438.69±9.55	473.33±13.84
12 weeks	-----	----	750.55±14.24	814.35±15.12
20 weeks	1357±16.55	1376±12.58	1413.18 ± 20.80	1427.97±20.21
40 weeks	1712±14.58	1698±13.66	1652.03 ± 19.10	1549.14±21.58
Egg weight (g)				
28 week	35.91±0.28	36.11±0.21	41.86 ± 0.41	40.60±0.11
40 week	42.48±0.39	40.48±0.23	45.77 ± 0.39	45.46±0.36
52 week	48.65±0.29	46.65±0.28	47.52±0.42	49.86±0.15
ASM (days)				
Age at 1st Egg	162	164	146	152
Age at 25% HHEP	171	174	154	166
Age at 50% HHEP	189	189	179	203
Egg production to 40 weeks				
Hen housed	33.12	36.68	46.83	40.10
Hen day	34.09	38.09	52.31	42.02
Survivor	34.35	39.40	53.82	43.03
Egg production to 52 weeks				
Hen housed	56.94	58.96	72.46	67.89
Hen day	57.58	63.58	83.33	72.45
Survivor	59.13	66.07	92.45	76.28
Egg production up to 72 week				
Hen Housed	78.76	80.62	84.10	84.30
Hen day	82.35	85.16	87.65	89.37
Survivor	88.40	91.52	94.56	95.49

varied in 4 chicken varieties. The body weights were significantly higher in C_1 variety and Vanaraja and lower in Gramapriya. Similarly the egg weights were significantly ($p<0.05$) higher in C_1 cross throughout the laying period. The egg production in C_1 cross was better than Vanaraja and C_2 cross at all ages; however the egg production was on par with Gramapriya at 64 and 72 weeks of age. Results obtained in the present study were consistent with the earlier observation of Yadav *et al.* (2017). He reported annual egg production (81), average age at first laying (181 days) average egg weight (34.3 gms) body weight 542 gms at 8 weeks in male and 450g ms in female, 885 gms at 12 weeks in males and 772 gm in females and at 72 weeks 1800 gms in males and 1578 gms in females in Ankaleshwar breed of poultry. Haunshi *et al*. (2011) compared the Assel and Kadaknath breed of poultry and observed that the Aseel breed showed ($P < 0.001$) higher BW at different ages; greater egg weights at 28, 32, and 40 weeks 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 ($P < 0.001$). Alireza *et al.* (2013) observed the average weight of native hen and rooster pullets in Isfahan Province at ages of 8, 12 and 24 week that were respectively 671.5 and 853.3, 928.7 and 1198.7 237, 1765.5 and 2167.9 gram.

The phenotypic means and variability for different traits was estimated generation wise and the phenotypic time trends over the generations was estimated for various growth performance traits. The analysis revealed positive phenotypic trends in day old chick weight (0.70 g), 8 weeks BW (34.64 g), 12 weeks BW (63.80 g) 20th week body weight (25.01 g), negative trend in age at first egg (-4.8 days) and age at 25% HHEP (-3.5 days), positive trend in egg weight at 28-week (2.1 g), 40-week (1.5 g) and 52-week (0.4 g). The hen day egg production at 40 weeks, 52 weeks and 72 weeks of age showed positive phenotypic trend of 3.8, 6.1 and 2.3 eggs. Further, hen housed and survivor egg production also showed positive trend estimates at 40, 52 and 72 weeks age. Negative or declining trends were observed in growth traits *viz*. 4 weeks BW (-16.4 g) and 40 weeks BW (-53.45 g). The results of present analysis indicated the effectiveness of the selection along with improved management for bringing improvement in egg production traits of the population in succeeding generations.

Table 2: Phenotypic trend estimates of native birds over different generation

Trait	Phenotypic trend	Trait	Phenotypic trend
Body Weight		Age at 25% HHEP	3.2
Day old	0.70	HHEP	
4 week	-16.4	40 week	3.1
8 week	34.64	52 week	4.6
12 week	63.80	72 week	1.7
20 week	25.01	HDEP	
40 weeks	-53.45	40 week	3.8
Egg Weight		52 week	6.1
28 week	2.1	72 week	2.3
40 week	1.5	SEP	
52 week	0.4	40 week	4.2
Age at first egg	-4.8	52 week	7.7
Age at 25% HHEP	-3.5	72 week	2.3

CONCLUSION

The result of present analysis indicated that there was continual improvement of native birds over different generation**.** Positive phenotypic trend reflect the effect of selection along with improved manage mental practices for bringing improvement in growth and production traits of the population in succeeding generations.

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