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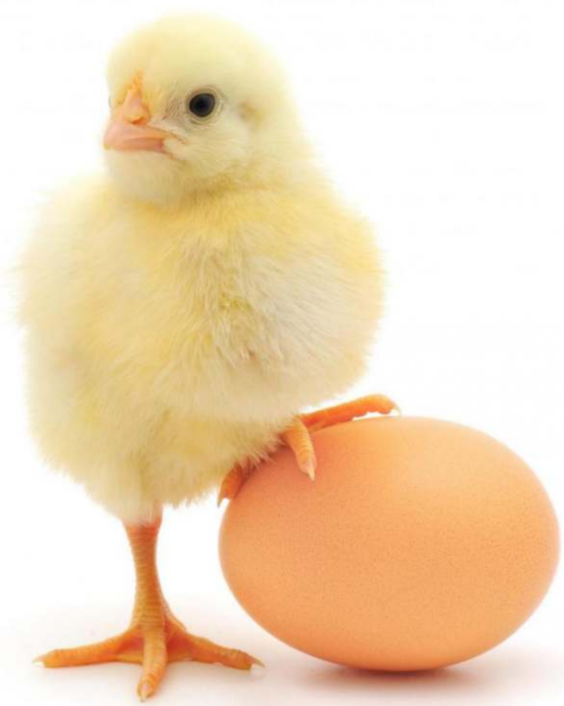

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Effect of Introgressing Dwarf Gene from Bangladeshi Indigenous to Exotic Breeds on Egg Production

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Abstract: An experiment was conducted to assess the effect of introgressing autosomal recessive dwarf gene (adw) from Bangladeshi indigenous (deshi) dwarf (DD) chicken to Rhode Island Red (RIR), White Leghorn (WLH) and Fayoumi (FO) on body weight and egg production. Deshi normal (DN), DD, RIR, WLH and FO were used in crossings to produce 8 genotypes; RIR, WLH, FO, DN, DD, RIR x DD, WLH x DD and FO x DD. At 19 weeks of age, for separation of crossbreds into normal and dwarf on the basis of shank length, altogether gave 11 genetic groups; RIR, WLH, FO, DN, DD, RIR x DD normal, WLH x DD normal, FO x DD normal, RIR x DD dwarf, WLH x DD dwarf and FO x DD dwarf. At 19 weeks of age, 154 pullets; 14 from each genetic group were individually caged up to 42 weeks of age to compare egg production performance. Introgression of adw gene significantly reduced mature body weight and feed intake and adw pullets utilized feed more efficiently into egg mass in comparison with their normal size counterparts. Conservation and improvement of deshi adw chicken is suggested for their future use in breeding for egg production.

Key words: Autosomal, dwarf, conservation and indigenous

Introduction

Collection, evaluation and conservation of different chicken genotypes are an insurance against future need (Crawford, 1984). Recently, monotype has been grown in the poultry industry and therefore, conservation of more genotypes is sought to overcome the vulnerability of monotypic chicken population to meet up future challenge likely to occur for the changes in environment, management and food habit. The random mated unselected indigenous chicken population is a huge treasure of variable genotypes. The deshi chicken population in developing countries is disappearing following invasion of improved stock from developed countries. Therefore, a thorough study among deshi chicken population is suggested to conserve them if found worthy (FAO, 1984). As a part of an effort to conserve deshi germplasm of chickens, autosomal recessive dwarfism has been found in Bangladesh (Yeasmin and Howlider, 1998). Deshi autosomal recessive dwarf (DD) hens had higher egg production, reduced feed intake and higher efficiency in converting feed into egg mass in comparison with their normal size deshi (DN) counterparts. In the current study, crossing was made using Rhode Island Red (RIR), White Leghorn (WLH), Fayoumi (FO), DN and DD to asses the effect of introgressing autosomal recessive dwarf gene from deshi chicken to exotic stocks on body weight and egg production potential.

Materials and Methods

Crossing were made using RIR, WLH, FO, DN and DD to produce 8 genotypes; RIR, WLH, FO, DN, DD, RIR × DD, WLH × DD and FO × DD. Progenies were wing banded and reared separately according to genotype and shank lengths were recorded up to 18 weeks of age. At 19 weeks of age, RIR × DD, WLH × DD and FO × DD crossbreds were separated into normal sized and dwarf genetic groups on the basis of shank length (Raut *et al.,* 1996). Birds having shank length of 6cm or below was considered as dwarf, while those with shank length, above 6cm were considered as normal size. As a result, 11 genetic groups were emerged; RIR, WLH, FO, DN, DD, RIR × DD normal, RIR × DD dwarf, WLH × DD normal, WLH × DD dwarf, FO × DD normal and FO × DD dwarf. At 19 weeks of age a total of 154 pullets, 14 from each genetic group were individually caged and their egg production potential were compared up to 46 weeks of age.

Results

The egg production performances of different genetic groups are shown in Table 1.

In egg mass production, RIR, WLH and FO normal size crossbreds were (10.72, 6.23 and 8.78%) superior to their dwarf crossbred counterparts. RIR, WLH and FO dwarf crossbreds were superior (32.58, 31.76 and 28.71%), respectively to normal deshi hens whereas, normal deshi hens (4.06%) were superior to dwarf counterparts. All phenotypic dwarf crossbreds ate less feed than their normal crossbred counterparts ($p<0.01$). RIR, WLH and FO dwarf crossbreds had 10.79, 11.15 and 15.11% reduced feed intake respectively than in their normal size crossbred counterparts. Deshi dwarf hens had 23.02% less feed intake than that of normal

Table 1: Production and reproduction parameters of Rhode Island Red (RIR), White Leghorn (WLH), Fayoumi (FO), Deshi Normal (DN), Deshi Dwarf (DD), RIR × DD normal, RIR × DD dwarf, WLH × DD normal, WLH × DD dwarf, FO × DD normal and FO × DD dwarf pullets up to 322 days of age

Genetic Group	Parameters						
	Rate of lay (%)	Egg mass production (g/bird/day)	Feed intake (g/bird/day)	FCR	Weight of 1st egg (g/egg)	Egg weight (g/egg)	Age at sexual maturity (days)
RIR	71.07[a]	37.20[a]	96.07[a]	2.60[d]	41.47[a]	52.45[a]	182.50[ab]
WLH	74.05[a]	33.25[b]	92.71[b]	2.80[cd]	38.59[b]	44.86[b]	178.07[bc]
FO	72.41[a]	31.93[b]	93.55[b]	2.94[cd]	31.95[d]	44.12[b]	180.20[bc]
DN	44.03[c]	16.74[f]	75.10[e]	4.75[a]	29.76[de]	37.76[e]	169.00[d]
DD	43.26[c]	16.06[f]	57.81[h]	3.61[b]	29.37[e]	37.10[e]	170.60[d]
RIR × DD normal	63.68[b]	27.81[c]	84.67[c]	3.08[c]	35.28[c]	43.77[b]	181.80[ab]
RIR × DD dwarf	61.31[b]	24.83[de]	75.53[e]	3.08[c]	32.08[d]	40.45[c]	174.00[cd]
WLH × DD normal	64.86[b]	26.16[cd]	78.91[d]	3.05[c]	35.79[c]	40.28[c]	185.11[ab]
WLH × DD dwarf	59.89[b]	24.53[de]	70.11[f]	2.89[cd]	31.12[de]	40.88[c]	178.90[bc]
FO × DD normal	64.32[b]	25.74[cde]	79.17[d]	3.08[c]	32.03[d]	39.94[cd]	179.50[bc]
FO × DD dwarf	60.02[b]	23.48[e]	67.21[g]	2.88[cd]	30.51[de]	38.36[de]	187.75[a]
Significance[+]	**	**	**	**	**	**	**
Co-efficient of variation (%)	9.97	11.36	2.47	13.44	8.42	5.38	4.74

[+] **, P<0.01

deshi hens. Even, WLH and FO dwarf crossbreds had lower feed intake (6.64 and 10.51%) than in normal deshi hens. The feed conversion (FC) for producing egg mass in general was higher in dwarf crossbreds than in their normal size counterparts. However, FCE showed little variation among different dwarf crossbreds. Introgression of dwarf gene slightly reduced egg size in dwarf crossbreds than in their normal size counterparts.

Deshi pullets had earlier sexual maturity than those did in exotic breeds and their crossbreds. On the other hand, deshi normal had slightly earlier (1.6 days) sexual maturity than their dwarf counterparts. For RIR, crossbreeding enhanced sexual maturity both for normal and dwarf hens. In FO, crossbreeding enhanced sexual maturity in normal and delayed in dwarf crossbreds. In general, dwarf genotypes had a marked reduced body size than their normal sized counterparts and the pure exotic breeds (p<0.01) higher (35.06 and 34.18%) body weight than their dwarf counterparts.

Discussion

Reduced egg production (Table 1) recorded for RIR × DD, WLH × DD and FO × DD dwarf pullets (2.37, 4.97 and 4.3%) than their pure × DD normal counterparts is supported by majority of the previous findings. Decuypere *et al*. (1991) recorded 9.5% lower egg production in dwarf hens than that in normal. Arscott and Bernier (1968) reported that dwarf birds laid 13% less than that of normal WLH layers. Dorminey *et al*. (1974) reported that the hen day and hen housed egg production in normal and dwarf Leghorns were 65 and 58.5% and 62.7 and 53.5% respectively. Polkinghorne (1976) observed 19.1% lower egg production in AU × WLH heterozygous dwarfs than that in their normal counterparts. Khan (1987) however contradicted the current findings reporting a higher egg production in dwarfs than those in normal hens.

In this study for RIR and FO dw crossbreds, egg production and egg weights were reduced leading to lower egg mass yield than their normal crossbred counterparts. Though a dw Leghorns had a higher egg weight than normal, but still they were inferior to normal in egg mass mainly because of decreased rate of lay. In comparison with mid parent values crossbreeding decreased egg mass production. Crossbreeding related egg mass reduction in RIR was higher for dwarfs, while in WLH and FO it was higher for normal in comparison with their opposite counterparts. The reduced egg mass for dwarfism recorded agrees with the observation of Horst *et al*. (1996). They concluded that egg number and egg weight and therefore, egg mass may be reduced for dwarfism in most of the cases in different locations.

All dwarf crossbreds consumed less feed and utilize them more efficiently for egg production than in corresponding normal (p<0.01). All crossbreeds irrespective of dwarfing inheritance ate less feed compared to mid-parent records. The rate of reduction in feed intake compared to mid-parent was higher in WLH and FO dwarfs, while it was less for RIR dwarfs than their normal size counterparts. Thus, feed intake reduction for dwarfism was less for heavier RIR and more for lighter WLH and FO. The inferiority of RIR dwarf in feed conversion may possibly be attributed to their higher relative feed intake which again may be explained by less reduction of body weight for dwarfism in RIR. Reduced feed consumption and their efficient conversion to eggs recorded in dwarfs agree with many previous findings (Guillaume, 1976; Polkinghorne, 1976).

Lower egg weight in dwarf crossbreeds in comparison with their normal crossbred counterparts is partially agrees with Decuypere *et al*. (1991). They recorded lighter eggs in dw hens than in their normal size counterparts. A higher egg weight recorded in WLH dwarf crossbreeds than in their normal counterparts is supported by Hutt (1959) who got heavier eggs in dwarf population than in normal. Contradicting current findings Selvarajah (1971) has shown that dw increased 1st egg weight in WLH. It appeared that influence of dwarfism on egg weight was breed and age dependent.

Earlier sexual maturity obtained in RIR × DD and WLH × DD dwarf pullets than in their normal crossbred counterparts agree with Ramappa *et al*. (1976). Contradicting the current findings, Khan (1976) did not found any relation of dw gene with age at sexual maturity. Delayed sexual maturity that found in FO for adw gene contradicts most of the previous findings. But, it has been supported by Decuypere *et al*. (1991) who reported in broiler strains that in normal and dwarfs sexual maturity were reached at 152 and 157 days of age respectively. Breed related enhancement or delay in sexual maturity for adw obtained from Barua *et al*. (1992) who recorded age at sexual maturity of 169 days for normal and 170.60 days for dwarf.

The dwarf gene found in deshi chicken seemed to be worthy. There is a possibility of synthesizing suitable dwarf layers in lowering maintenance feed requirement to rear under scavenging by introducing adw gene from deshi chicken. It is suggested to conserve and improve deshi chicken for future use in breeding.

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