PERFORMANCE OF *DESI* X EXOTIC CROSS-BRED LAYERS

By

M. V. JAYANTHY

THESIS

Submitted in partial fulfilment of the requirement for the degree

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Faculty of Veterinary and Animal Sciences
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Department of Poultry Science
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Mannuthy Thrissur

1992

DECLARATION

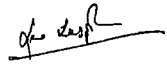
I hereby declare that this thesis entitled **PERFORMANCE OF DESI X EXOTIC CROSS BRED LAYERS** is a bonafide record of research work done by me during the course of my research and that this thesis has not previously formed the basis for the award to me of any degree diploma associateship fellowship or other similar title of any other University or Society

Mannuthy
17 8 1992

M V JAYANTHY

CERTIFICATE

Certified that this thesis entitled PERFORMANCE OF DESI X EXOTIC CROSS-BRED LAYERS is a record of research work done independently by **Ms M V Jayanthy** under my guidance and supervision and that it has not previously formed the basis for the award of any degree fellowship or associateship to her



Dr Leo Joseph
(Chairman Advisory Committee)
Associate professor
Department of Poultry Science

Mannuthy
7 8 92

CERTIFICATE

We, the undersigned members of the Advisory Committee of Ms M V Jayanthy, a candidate for the degree of Master of Veterinary Science in Poultry Science agree that the thesis entitled PERFORMANCE OF DESI X EXOTIC CROSS BRED LAYERS may be submitted by Ms M V Jayanthy in partial fulfilment of the requirement for the degree

Dr Leo Joseph
(Chairman, Advisory Committee)
Associate Professor
Department of Poultry Science

Dr A Ramakrishnan
Director, CASPS
Mannuthy

Dr G Reghunathan Nair
Associate Professor
Department of Poultry Science

Dr Stephen Mathew
Associate Professor
Department of Animal Breeding and Genetics

External Examiner

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M V JAYANTHY

Dedicated to
my beloved parents

C O N T E N T S

LIST OF TABLES

LIST OF PLATES

Introduction

INTRODUCTION

The Indian poulty industry has forged ahead as one of the fast growing segments not only in the livestock sector but also in the agricultural sector as a whole during the last two decades The total chicken population in India was estimated to be 180 57 millions during 1990 which included 139 40 million desi birds and 41 17 million improved birds The estimated egg production from these birds were 1020 million and 23580 million respectively and India occupies the fifth place in egg production in the world The projected figures of per capita annual availability were 30 eggs and 444 g poultry meat during the year 1990 (Anon 1990) These figures are far below the minimum requirement recommended by Nutritional Advisory Committee Government of India Considering these aspects efforts are to be continued to enhance the production of eggs and meat from various classes of birds including desi stock

Poultry farming is considered as an economic enterprise for rural women unemployed youth and weaker sections of the society Although backyard system of rearing poultry has been largely replaced by scientific intensive systems the traditional system has definite role in developing countries especially in rural areas The low investment and the low cost technology required for this system lend itself for adoption in rural areas for improving the conditions of rural farmers Possibly because

of these reasons this system is still popular in rural areas of India particularly in coastal states like Kerala Karnataka and Goa Chicken reared in the rural parts of these places are by and large native (desi) birds

High mortality rate and adverse environmental conditions work as counterforce to successful rearing of exotic high producing birds in rural areas under the traditional homestead farming system Therefore it is more practical to improve the production in this system by suitable alternate technology rather than introducing a variety of totally new birds to the villagers Upgradation of desi flock by cross breeding with stocks that combine well and produce reasonably well under the homestead environment is possibly the method of choice In doing so some of the traits of native breeds/varieties may have to be retained For example broodiness is a desirable trait, common to all native breeds Total elimination of this trait by appropriate breeding techniques improves egg production but the rural farmer has to seek help elsewhere for getting the eggs incubated for replace ment stock Therefore the strategy should be to reduce the number of broody pauses rather than its total elimination Taking these factors into consideration attempts are being made to develop birds adapted to tropical environment and traditional system of rearing with better productivity

In Kerala backyard system of poultry keeping is the most popular system of maintaining layers In general farmers observed that pure bred exotic chickens did not thrive well under backyard system In order to mitigate this situation Kerala Agricultural University evolved the cross bred chicken Austra White which has already been established as a bird suitable for backyard rearing This bird has white plumage with scarce black patches However the farmers have preference for birds with coloured plumage for household rearing New Rock birds have coloured plumage patterns such as Orange brown Chestnut etc Desi stocks are the most adapted for backyard rearing and among them Naked neck variety is regarded as having better egg production potential It is expected that introduction of desi germplasm in any breeding programme for a backyard bird is likely to improve the viability and to have an acceptable plumage colour

The Naked neck (Na) allele is dominant over normal feathered neck allele $(na)_1$ (Hutt 1949) In the apparently unselected population of desi birds there is an appreciable proportion of Naked neck birds It appears to be distributed in sub tropical tropical or equatorial zones especially in areas with hot humid climates (Merat 1986)

A study was planned to cross the two breed crosses viz Austra White and New Rock females available at University Poultry

Farm with Naked neck desi males procured from farmers and to test the progeny The Austra White is an egg type cross whereas New Rock is a dual purpose cross

The present investigation was taken up with the following objectives

1 To evaluate the two crossbred layers viz desi (D) x Austra White (AW) and desi (D) x New Rock (NR) based on production traits for the part year period and
2 to study the influence if any of Naked neck gene on egg production traits

Review of Literature

REVIEW OF LITERATURE

Body Weight

The body weight in laying hens is important more because of its relation to feed consumption sexual maturity and egg weight than its direct effect on economic return Body weight of layer type birds is measured at the time of housing at sexual maturity and at liquidation The body weight of different breeds, strains and their crosses involving native breeds at different ages as observed by different workers are presented in Table 1

Huq et al (1976) reported that the White Cornish x desi was heavier and weighed 2814 g at sexual maturity whereas White Leghorn x desi and New Hampshire x desi weighed 998 and 1700 g respectively at sexual maturity Sah et al (1984) recorded heavier body weight for desi x White Leghorn than for White Leghorn x desi They also pointed out that desi x White Leghorn were similar to or heavier than those of White Leghorn Jain and Chowdhry (1985) reported that the breed crosses involving desi showed lower body weight than the exotic breeds and their crosses The two way crosses involving desi birds registered an average body weight of 1230 85 g at 5 months of age and three way crosses showed a higher mean body weight of 1251 g

Meregalli (1957) Volkov et al (1957) Aggarwal and Sapra (1972) Karapetyan et al (1978) Al Soudi and Al Jebouri (1979) Saeki and Inone (1980) Radhakrishnan and Ramakrishnan (1982) Hamdy et al (1983) Omeje and Nwosu (1986) Thomas and Rao (1988) and Amer (1991) also reported the body weights of different breeds and breed crosses at various ages However desi and its crosses tended to be lighter compared to exotic breeds at all ages

Age at Sexual Maturity

Age at sexual maturity (ASM) is calculated as age at 50 per cent production in a flock An earlier maturity is likely to yield more number of eggs Reports of age at sexual maturity in various desi breeds and crosses are presented in Table 2

Acharya and Kumar (1971) reported that Rhode Island Red x desi matured earlier (201 8 days) followed by desi desi x Rhode Island Red and Rhode Island Red Huq et al (1976) showed that White Leghorn x desi matured earlier at 213 days of age followed by New Hampshire x desi and White Cornish x desi Saeki and Inone (1980) reported that White Leghorn matured earlier at 158 9 days and Red jungle fowl at 298 3 days The reciprocal crosses involving the White Leghorn and Red jungle fowl matured in between these limits Sah et al (1985) pointed out that desi White Leghorn x desi desi x White Leghorn and White Leghorn matured at ages of 203 22 184 27 171 06 and 165 59 days respectively Chapel

Table 1 Body weights of different breed crosses as reported by various authors

Authors	Year	Country	Breed/Breed cross	Age	Body weight (g)
1	2	3	4	5	6
Meregalli	1957	Italy	Arno	Adult	M 3000 F 2200
Volkov et al	1957	Kuchin	Kuchin Anniversary	Adult	M 3800 F 3000
Aggarwal et al	1972	India	desi Black Bengal Naked neck	12 w	590 656 629
Huq et al	1976	Bangladesh	White Leghorn x desi New Hampshire x desi White Cornish x desi	213 d 240 d 274 d	998 1700 2814
Karapetyan et al	1978	Armenia	Erevan x White Leghorn	5 m	1625
Al Soudi and Al Jebouri	1979	Iraq	Iraqui Iraqui cross White Leghorn New Hampshire	1 y	1611 1610 1687 2286
Saeki and Inone	1980	Japan	White Leghorn (WL) Red Jungle fowl WL x Red Jungle fowl Jungle fowl x WL	159 d 298 d 163 d 182 d	1762 887 1347 1259

Contd

Table 1 Continued

1	2	3	4	5	6
Radhakrishnan and Ramakrishnan	1982	India	White Leghorn (WL)	20 w	886
				40 w	1382
			Rhode Island Red (RIR)	20 w	876
				40 w	1546
			Australorp (ALP)	20 w	998
				40 w	1752
			WL x RIR	20 w	1110
				40 w	1524
			WL x ALP	20 w	1064
				40 w	1516
			RIR x ALP	20 w	1084
				40 w	1644
			RIR x WL	20 w	1134
				40 w	1472
			ALP x WL	20 w	1142
				40 w	1570
			ALP x RIR	20 w	1180
				40 w	1764
Hamdy et al	1983	Egypt	Alexandria	90 dp	1860
			Silver Montazah		1688
			Gimmizah		1853
			Bandara		1813
Sah et al	1984	India	desi	20 w	F 562
					M 716
			desi x White Leghorn		F 750
					M 777
			White Leghorn x desi		F 668
					M 725

Contd

Table 1 Continued

1	2	3	4	5	6
Jain and Chowdhry	1985	India	White Leghorn (WL)	5 m	1306
			Rhode Island Red (RIR)		1511
			desi		1036
			WL x desi		1163
			desi x WL		1223
			RIR x desi		1234
			desi x RIR		1303
			RIR x WL		1441
			WL x RIR		1465
			RIR x (WL x desi)		1249
			RIR x (desi x WL)		1363
			WL x (RIR x desi)		1126
			WL x (desi x RIR)		1222
			desi x (RIR x WL)		1279
			desi x (WL x RIR)		1267
Omeje and Nwosu	1986	Nigeria	Gold Link (GL) x Local Nigerian (LN)	20 w	1041
			LN x GL		1046
			GL (GL x LN)		1123
			LN (LN x GL)		955
Thomas and Rao	1988	India	Kadakanath	20 w	1205

Contd

Table 1 Continued

1	2	3	4	5	6
Amer	1991	Egypt	Fayoumi	188 d	1438
			Dokki 4	190 d	1490
			Golden Montazah	164 d	1600
			Silver Montazah	163 d	1720
			Mandarah	181 d	1710
			Matrouh	167 d	1460
Nair	1991	India	New Rock	20 w	1689
				40 w	2009
			Austra White	20 w	1172
				40 w	1352

d days w weeks m months y year dp days of production M male F female

(1951) Meregalli (1957) Kamar et al (1978) Abdel Kadar and El Hossari (1979) Kumar and Acharya (1980) Sharma (1980) Radhakrishnan and Ramakrishnan (1982) Mahmoud et al (1983) Costantini and Panella (1985) Omeje and Nwosu (1986) Thomas and Rao (1988) and Amer (1991) also reported the age at sexual maturity of various breed crosses involving desi There was no uniformity in the reports regarding this trait While in most cases reports related to age at 50 per cent production other ages were also reported It may be observed that desi and desi crosses were late in attaining sexual maturity (200 days and above while exotic high producing birds matured much earlier (160 180 days)

Egg Production

The number of eggs produced in a certain time interval is generally used as a measure of the productive capacity of a hen under specified environmental conditions The egg production varies from breed to breed under different conditions This parameter can be studied for different part production periods for convenience

production upto 280 days of age of the birds represents the part year production and that upto the age of culling (72 weeks of age) is the full year production

Egg production can be expressed in different ways viz hen housed production hen day production and surviver production either as number or as percentage Hen housed measure is more informative

Table 2 Age at sexual maturity of different breed crosses reported by various authors

Authors	Year	Country	Breed/Breed cross	Age at sexual maturity (days)
1	2	3	4	5
Chapel	1951	Puerto Rica	Native hen	195 0
			White Leghorn	192 0
			New Hampshire	225 0
Maregalli	1957	Italy	Arno	162 4
Acharya and Kumar	1971	India	Rhode Island Red (RIR)	271 6 + 1 9
			desi	204 3 + 4 4
			desi x RIR	216 0 + 1 9
			RIR x desi	201 8 + 7 9
Huq et al	1976	Bangladesh	White Leghorn x desi	Age at 20% production 213 0
			New Hampshire x desi	240 0
			White Cornish x desi	274 0
Kamar et al	1978	Egypt	Fayoumi x RIR	249 0
			White Baladi x RIR	307 0
Abdel Kadar and El-Hossari	1979	Egypt	Fayoumi	210 5 + 18 4
			Rhode Island Red	241 7 + 16 2
Kumar and Acharya	1980	India	desi	208 76 + 1 47

Contd

Table 2 Continued

1	2	3	4	5
Saeki and Inone	1980	Japan	White Leghorn (WL)	158 9 + 20 7
			Red Jungle fowl	298 3 + 38 0
			WL x Jungle fowl	163 4 + 19 9
			Jungle fowl x WL	182 2 + 27 5
Sharma	1980	India	Rhode Island Red	217 0
Radhakrishnan and Ramakrishnan	1982	India	White Leghorn (WL)	182 6
			Australorp (ALP)	193 4
			Rhode Island Red (RIR)	97 4
			WL x ALP	180 8
			WL x RIR	172 6
			ALP x WL	171 0
			ALP x RIR	184 0
			RIR x WL	177 2
			RIR x ALP	184 4
Mahmoud et al	1983	Egypt	Alexandria	157 0
			Silver Montazah	165 0
			Gimmizah	167 0
			Bandara	186 0
Constantini and Panella	1985	Italy	New Hampshire (NH)	172 2
			White Plymouth Rock (WPR)	219 6
			Barred Plymouth Rock (BPR)	193 6
			Rhode Island Red (RIR)	187 6
			White Leghorn (WL)	155 3
			BPR x RIR	181 4
			WPR x RIR	191 0
			Golden Comet	158 8
			Warren	161 8
			Seven days hybrid	177 0

Contd

Table 2 Continued

1	2	3	4	5
Sah *et al*	1985	India	White Leghorn	165 6
			desi	203 2
			desi x White Leghorn	171 1
			White Leghorn x *desi*	184 3
Omeje and Nwosu	1986	Nigeria	Gold Link (GL) x Local Nigerian (LN)	163 7
			LN x GL	161 0
			GL x (GL x LN)	168 5
			LN x (LN x GL)	158 2
Thomas and Rao	1988	India	Kadakanath	189 2 + 15 65
Amer	1991	Egypt	Fayoumi	188 4
			Dokki 4	190 0
			Golden Montazah	163 8
			Silver Montazah	163 0
			Mandarah	181 0
			Matrouh	167 0
Leo	1991	India	New Rock	194 0
			Austra White	184 0

as it takes care of age at sexual maturity rate of lay and viability during the period under study

Reports of egg production by different authors for native (desi) breeds and their crosses is presented in Table 3 Kodinec (1957) reported that Naked neck birds produced 140 180 eggs during a period of one year Acharya and Kumar (1971) pointed out that egg production was highest for Rhode Island Red followed by desi x Rhode Island Red Rhode Island Red x desi and desi They also concluded that the egg production during summer was highest for desi x Rhode Island Red Jain et al (1978b) reported that 2 way crosses involving desi breed produced higher egg mass upto 400 days of age than three way crosses The two way crosses has an average egg mass of 5 05 kg compared to three way crosses which produced 4 46 kg during the same period The reports indicated the possibility of improving production of desi through crossing with Rhode Island Red (RIR) and also improving the survivability of RIR by introducing desi inheritance with marginal decline in egg production

Sah et al (1985) showed that during period upto 240 days of age desi White Leghorn x desi desi x White Leghorn and White Leghorn contributed 19 11 26 82 32 09 and 41 83 per cent hen day egg production respectively It indicated the superiority of desi as male line rather than the reciprocal cross and pure

desi Omeje and Nwosu (1986) reported that two way crosses involving Local Nigerian birds produced 48 89 and 51 65 per cent hen day production and three way crosses produced 49 2 and 51 38 per cent upto 34 weeks of age However the difference between the two way and three way crosses were non significant Thomas and Rao (1988) recorded an egg production of 49 79 eggs during 300 days of age in Kadakanath birds

Chapel (1951) Meregalli (1957) Volkov et al (1957) Aggarwal and Sapra (1972) Al Soudi and Al Jebouri (1979) Radha krishnan and Ramakrishnan (1982) and Amer (1991) reported the egg production of various native breeds and breed crosses which are set out in Table 3

The reports of egg production by various workers were not during identical periods However pure desi birds had only one third to half the production compared to exotic birds The hen day egg production was less than 30 40 per cent and number varied from 110 150 for full year production Cross breeding improved the egg number in sthe desi stock as evident from the reports of Acharya and Kumar (1971) Jain et al (1978b) and Sah et al (1985)

Table 3 Egg production of different breed crosses as reported by various authors

Author	Year	Country	Breed/Breed cross	Criterion of measurement	Value
1	2	3	4	5	6
Chapel	1951	Puerto Rica	Native Puerto Rican	Egg number upto 120 dp	21 20
			White Leghorn		45 70
			New Hampshire		47 80
Kodinec	1957		Naked neck	1 yp	140 180
Meregalli	1957	Italy	Arno	1 yp	120 40
Volkov et al	1957	Kuchin	Kuchin Anniversary	1 yp	112 127
Dascula et al	1964		New Hampshire x local	1 y	130 50
Acharya and Kumar	1971	India	Rhode Island Red (RIR)	HDP during summer	27 47
			desi		22 80
			desi x RIR		33 31
			RIR x desi		28 78
Aggarwal and Sapra	1972	India	desi	HDP	26 44
			Naked neck		22 19
			Black Bengal		19 53
			Aseel		17 12

Contd

Table 3 Continued

1	2	3	4	5	6
Jain *et al*	1978b	India	White Leghorn (WL)	EM 400 d	6 76
			Rhode Island Red (RIR)		6 89
			desi (D)		2 26
			WL x RIR		7 12
			WL x *desi*		3 52
			RIR x WL		7 04
			RIR x *desi*		4 526
			desi x WL		3 822
			desi x RIR		4 26
			WD R		5 29
			DW R		4 50
			WR D		3 38
			RW-D		3 43
			RD-W		5 09
			DR W		4 09
Karapetyan *et al*	1978	Armenia	White Leghorn x Erevan	1 yp	221 00
			White Leghorn		200 00
			Erevan line 1381		183 00
Szado and Baczkowska	1978	Poland	New Hampshire (NH)	AP	195 00
			White Leghorn (WL)		183 00
			WL x NH		195 00
			White Plymouth Rock x (WL x NH)		202 00
Abdel Kader and El-Hossari	1979	Egypt	Fayoumi	90 dp	28 00
			Rhode Island Red		35 60

Contd

Table 3 Continued

1	2	3	4	5	6
Jain *et al*	1978b	India	White Leghorn (WL)	EM 400 d	6 76
			Rhode Island Red (RIR)		6 89
			desi (D)		2 26
			WL x RIR		7 12
			WL x *desi*		3 52
			RIR x WL		7 04
			RIR x *desi*		4 526
			desi x WL		3 822
			desi x RIR		4 26
			WD R		5 29
			DW R		4 50
			WR D		3 38
			RW D		3 43
			RD W		5 09
			DR W		4 09
Karapetyan *et al*	1978	Armenia	White Leghorn x Erevan	1 yp	221 00
			White Leghorn		200 00
			Erevan line 1381		183 00
Szado and Baczkowska	1978	Poland	New Hampshire (NH)	AP	195 00
			White Leghorn (WL)		183 00
			WL x NH		195 00
			White Plymouth Rock x (WL x NH)		202 00
Abdel Kader and El Hossari	1979	Egypt	Fayoumi	90 dp	28 00
			Rhode Island Red		35 60

Contd

Table 3 Continued

1	2	3	4	5	6
Al Soudi and Al Jebouri	1979	Iraq	Native Iraqui	HDP 1 y	39 60
			Iraqui cross		42 50
			White Leghorn		44 80
			New Hampshire		33 10
Sharma	1980	India	Rhode Island Red	100 dp	48 00
			White Leghorn		32 00
Radhakrishnan and Ramakrishnan	1982	India	White Leghorn (WL)	140 180 d HHN	28 30
			Australorp (ALP)		29 93
			Rhode Island Red (RIR)		22 48
			WL x ALP		35 03
			WL x RIR		43 00
			ALP x WL		52 97
			ALP x RIR		37 77
			RIR x WL		34 57
			RIR x ALP		39 77
Chowdhury et al	1983	India	50% WL + 50% RIR	Av pm	8 70
			75% WL + 25% RIR		9 60
			75% RIR + 25% WL		15 60
			100% WL		13 30
			100% RIR		11 10
Mahmoud et al	1983	Egypt	Alexandria	EPP 1 y	51 70
			Silver Montazah		56 30
			Gimmizah		45 60
			Bandara		47 20

Contd

Table 3 Continued

1	2	3	4	5	6
Sah *et al*	1985	India	White Leghorn	240 d	41 83
			desi		19 11
			desi x White Leghorn		32 09
			White Leghorn x *desi*		26 82
Omeje and Nwosu	1986	Nigeria	Gold Link (GL) x Local Nigeria (LN)	34 w	48 89
			LN x GL		51 65
			GL x (GL x LN)		49 20
			LN x (LN x GL)		51 38
Thomas and Rao	1988	India	Kadanath	300 d	49 79
Amer	1991	Egypt	Fayoumi	1 yp	160 00
			Dokki 4		167 40
			Golden Montazah		199 00
			Silver Montazah		205 80
			Mandarah		180 00
			Matrouh		192 30
Leo	1991	India	New Rock	40 W HPP %	47 79
			Austra White		49 97

d days w week y year dp - days of production HDP Hen day production
EM Egg mass yp year of production AP Annual production HHN Hen housed number
HHP Hen housed production Av pm Average production per month Epp Egg production per cent

Egg Weight

Egg weight is an important economic trait since larger eggs fetch better price The average weight of eggs produced by certain native breeds or breed crosses as reported by various authors are presented in Table 4

Kumar et al (1971) recorded egg weights of 54 29 47 04 51 06 and 50 2 g respectively for Rhode Island Red desi desi x Rhode Island Red and Rhode Island Red x desi birds Aggarwal and Sapra (1972) reported that Naked neck birds had a lower egg weight of 33 3 g compared to desi Black Bengal and Aseel birds Jain et al (1978a) recorded an egg weight of 40 45 g for desi birds They also reported that two way crosses involving desi birds produced lower egg weight (48 47 g) than the three way crosses involving desi (53 88 g) at 400 days of age Kumar and Acharya (1980) recorded an egg weight of 46 02 g for desi birds Mahapatra et al (1983) reported that Kadakanath birds produced eggs with an average weight of 40 08 g Birds with 75 per cent Kadakanath and 25 per cent White Leghorn inheritance and birds with 50 per cent Kadakanath and 50 per cent White Leghorn had egg weights of 48 32 and 46 52 g respectively

Chapel (1951) Kodinec (1957) Abdel Kader and El Hossari (1979) Mahmoud et al (1983) Sah et al (1985) Omeje and Nwosu (1986) and Thomas and Rao (1988) also reported the egg weights

Table 4 Egg weight of different breed crosses as reported by various authors

Author	Year	Country	Breed/Breed cross	Age	Egg weight(g)
1	2	3	4	5	6
Chapel	1951	Puerto Rica	Native Puerto Rican	120 dp	42 25
			White Leghorn (WL)		48 25
			New Hampshire (NH)		52 25
			WL x Native Puerto Rican		45 75
			NH x Native Puerto Rican		47 50
Kodinec	1957		Naked neck	1 y	58 70
Kumar et al	1971	India	Rhode Island Red (RIR)		54 29
			desi		47 04
			desi x RIR		51 06
			RIR x desi		50 25
Aggarwal and Sapra	1972	India	desi		36 70
			Naked neck		33 30
			Black Bengal		37 30
			Aseel		36 80
Jain et al	1978b	India	White Leghorn (WL)	400 d	58 74
			Rhode Island Red (RIR)		58 56
			desi (D)		40 45
			WL x RIR		58 49
			WL x desi		48 73
			RIR x WL		58 23
			RIR x desi		47 78
			desi x WL		49 24
			desi x RIR		48 11

Contd

Table 4 Continued

1	2	3	4	5	6
			(WL x desi) x RIR	400 d	56 83
			(desi x WL) x RIR		58 14
			(WL x RIR) x desi		50 06
			(RIR x WL) x desi		49 47
			(RIR x desi) x WL		55 62
			(desi x RIR) x WL		53 16
Szado and Baczkowska	1978	Poland	White Plymouth Rock (WPR)		60 00
			New Hampshire (NH)		61 00
			White Leghorn (WL)		58 00
			WL X NH		60 00
			WPR x (WL x NH)		63 00
Abdel Kader and El Hossari	1979	Egypt	Fayoumi		42 20
			Rhode Island Red		34 70
Kumar and Acharya	1980	India	desi		46 02
Saeki and Inone	1980	Japan	White Leghorn (WL)	Av ew	57 40
			Red Jungle fowl		34 80
			WL x Jungle fowl		46 70
			Jungle fowl x WL		48 20
Radhakrishnan and Ramakrishnan	1982	India	White Leghorn (WL)	280 d	53 20
			Australarp (ALP)		43 60
			Rhode Island Red (RIR)		44 67
			WL x ALP		46 26
			WL x RIR		50 75
			ALP x WL		48 80
			ALP x RIR		45 40
			RIR x WL		47 40
			RIR x ALP		45 00

Contd

Table 4 Continued

1	2	3	4	5	6
Choudhury et al	1983	India	50% White Leghorn + 50% Rhode Island Red		46 80
			75% White Leghorn + 25% Rhode Island Red		47 40
			75% Rhode Island Red + 25% White Leghorn		47 80
			100% White Leghorn		45 60
			100% Rhode Island Red		46 70
Mahmoud et al	1983	Egypt	Alexandria		48 80
			Silver Montazah		49 80
			Gimmizah		53 40
			Bandara		54 10
Mahapatra et al	1983	India	Kadakanath		40 08
			Aseel Kagar		45 39
			Aseel Peela		40 64
			Kadakanath x White Leghorn (WL)		42 85
			Kadakanath (Kadakanath x WL)		46 52
			Kadakanath x New Hampshire		48 32
Costantini and Panella	1985	Italy	Golden Comet		50 86
			Warren		50 26
			Seven ways hybrid		46 36
Sah et al	1985	India	desi	1st EW	22 66
			desi x White Leghorn		35 50
			White Leghorn x desi		31 36
			White Leghorn		46 08

Contd

Table 4 Continued

1	2	3	4	5	6
Omeje and Nwosu	1986	Nigeria	Gold Link (GL) x Local Nigerian (LN)	34 w	46 37
			LN x GL		45 84
			GL x (GL x LN)		50 59
			LN x (LN x GL)		43 65
Thomas and Rao	1988	India	Kadakanath	300 d	43 05
Amer	1991	Egypt	Fayoumi	A ew	40 50
			Dokki 4		49 80
			Golden Montazah		54 50
			Silver Montazah		53 70
			Mandarah		50 40
			Matrouh		56 80
Leo	1991	India	New Rock	40 w	47 83
			Austra White		49 68
Salahuddin and Howlider	1991	Bangladesh	Star cross		54 73
			Rhode Island Red		52 50
			Naked neck		53 53
			Fayoumi		38 37

d days w weeks y year dp days of production Av ew average egg weight
Ew egg weight A ew adult egg weight

of various native breeds and cross breeds at various age groups It may be observed that egg weight of desi birds and 50 per cent desi birds were less than 50 g indicating the inherent low egg weight in the desi birds

Feed Consumption/Feed Efficiency

Feed consumption and feed efficiency are important traits as far as economy of poultry keeping is concerned Feed efficiency is calculated as kilogram of feed required to produce one dozen of eggs Feed efficiency of native breeds and cross breds as reported by various authors are presented in Table 5

Aggarwal and Sapra (1972) reported that the four desi breeds viz Nondescript desi Naked neck Black Bengal and Aseel consumed 128 93 137 78 104 43 and 135 73 g feed per day, respectively with a corresponding feed efficiency (feed intake per kg egg) of 13 06 29 32 14 68 and 42 28 Jain et al (1978b) pointed out that desi birds showed a feed efficiency (feed per kilogram egg mass) of 8 8 The two way and three way crosses involving the desi birds recorded a uniform feed efficiency of 5 4 Karapetyan (1978), Al Soudi and Al Jebouri (1979) Satava and El Abiad (1979) and Hamdy et al (1983) also reported the feed efficiency and feed consumption of desi and their crossses It was noted that desi and their crosses consumed more feed per kilogram egg mass

Table 5 Feed consumption/feed efficiency of different breed crosses as reported by various authors

Author	Year	Country	Breed/Breed cross	Criterion of measurement	Feed con s mption/ feed efficiency
1	2	3	4	5	6
Aggarwal and Sapra	1972	India	desi	Feed/bird per day (g)	128 93
				Feed per kg egg mass (kg)	13 06
			Naked neck	Feed/bird per day (g)	137 78
				Feed per kg egg mass (kg)	29 32
			Black Bengal	Feed/bird per day (g)	104 45
				Feed per kg egg mass (kg)	14 68
			Aseel	Feed/bird per day (g)	135 75
				Feed per kg egg mass (kg)	42 28
Jain et al	1978b	India	White Leghorn (WL)	Feed/kg egg mass 400 days (kg)	4 34
			Rhode Island Red (RIR)		4 54

Contd

Table 5 Continued

1	2	3	4	5	6
			desi (DD)	Feed/kg egg mass 400 d (kg)	8 80
			WR		4 06
			WD		6 95
			RW		3 99
			RD		5 57
			DW		6 23
			DR		5 62
			WD R		4 63
			DW R		5 02
			WR D		6 59
			RW D		6 11
			RD W		4 81
			DR W		5 21
Karapetyan et al	1978	Armenia	Erevan x White Leghorn line cross	Feed per 10 eggs (kg)	2 10
			White leghorn line cross		2 50
Al Soudi and Al Jebouri	1979	Iraq	Iraqui	Feed/bird/day (g)	102 00
			Iraqui cross		107 00
			White Leghorn		112 00
			New Hampshire		125 00

Contd

Table 5 Continued

1	2	3	4	5	6
Satava and El Abiad	1979		Shaver Star Cross 288	Feed/kg egg mass (kg)	3 07
			Tetra SL eggs		3 32
Hamdy et al	1983	Egypt	Alexandria	Feed/kg egg mass (kg)	5 50
			Silver Montazah		5 60
			Gimmizah		6 00
			Bandara		6 30

Livability/Mortality

Livability is one of the important economic trait in poultry keeping The livability of native breeds and their crosses at different age groups as reported by different workers are set out in Table 6

Chapel (1951) reported that there was no apparent superiority of pure natives over standard breeds in respect of viability and resistance but there was some indications of greater disease resistance among cross breed birds Marais and Joubert (1968) recorded a lower mortality rate in Australorp x White Leghorn birds than the reciprocal cross Huq et al (1976) reported a livability of 87, 86 and 82 per cent for White Leghorn x desi New Hampshire x desi and White Cornish x desi respectively upto 16 weeks of age Sah et al (1984) indicated better livability in White Leghorn followed by desi x White Leghorn desi and White Leghorn x desi

Egg Quality

Kumar et al (1971) recorded higher egg weight Shape Index Yolk Index and Haugh Unit in Rhode Island Red pure breds where as shell thickness was highest in desi pure breds

Jain et al (1978a) reported that desi x White Leghorn had the thickest egg shell (0 0155 inch) and Rhode Island Red the

Table 6 Livability in different breed crosses as reported by various authors

Authors	Year	Country	Breed/Breed cross	Criterion of measurement	Value
1	2	3	4	5	6
Huq *et al*	1976	Bangladesh	White Leghorn x *desi*	Viability % upto 16 w	87 0
			New Hampshire x *desi*		86 0
			White Cornish x *desi*		82 0
Karapetyan	1978	Armenia	White Leghorn x Erevan	Livability 90 d	95 0
			Erevans		90 0
			White Leghorn		89 0
Al Soudi and Al Jebouri	1979	Iraq	Iraqui	Mortality % 1 y	0 7
			Iraqui cross		1 5
			White Leghorn		2 8
			New Hampshire		4 2
Radhakrishnan and Ramakrishnan	1982	India	White Leghorn (WL)	Livability % 280 d	88 0
			Australorp (ALP)		84 0
			Rhode Island Red (RIR)		92 0
			WL x ALP		84 0
			WL x RIR		80 0
			ALP x WL		96 0
			ALP x RIR		92 0
			RIR x WL		76 0
			RIR x ALP		80 0

Contd

Table 6 Continued

1	2	3	4	5	6
Chowdhary *et al*	1983	India	50% White Leghorn (WL) + 50% Rhode Island Red (RIR)	Mortality % 7 m	11 1
			75% White Leghorn + 25% Rhode Island Red		26 3
			75% Rhode Island Red + 25% White Leghorn		33 3
			100% White Leghorn + 100% Rhode Island Red		53 8 25 0
Sah *et al*	1984	India	White Leghorn	Mortality % 240 d	20 71
			desi		30 6
			desi x White Leghorn		23 9
			White Leghorn x *desi*		36 9

d days w weeks m months y year

thinnest (0 0133 inch) among the two way and three way crosses of desi and White Leghorn and Rhode Island Red Pure bred Rhode Island Red had the highest Haugh Unit (81 99) and White Leghorn x (Rhode Island red x desi) had the lowest (62 36)

Kumar and Acharya (1980) observed an egg weight of 46 02 in desi birds The Shape Index Haugh Unit Shell thickness and Yolk Index in desi eggs were 73 63 77 71 0 309 mm and 0 4655 respectively

Mahapatra et al (1983) reported that among Kadakanath Aseel Kagar Aseel Peela Kadakanath x White Leghorn Kadakanath x (Kadakanath x White Leghorn) and Kadakanath x New Hampshire the egg weight was highest for Kadakanath x (Kadakanath x White Leghorn) The Shape Index ranged from 73 to 76 in all the breeds and crosses Albumen Index was highest (0 11) in Aseel Kagar and Aseel Peela Shell thickness range from 0 32 to 0 34 mm in all the groups

Naked neck gene (Na) and production traits

Merat (1980) reported that egg weight in heterozygous Naked neck birds (Na na) were significantly higher than normal neck (na na) birds

Monnet et al (1982) observed that in control group (ambient temperature) body weight was less in Naked neck (Na na) birds

than normal neck (na na) birds In the heated group (31°C) 10th and 18th week body weight were heaviest for Naked neck (Na na) birds Bordas and Merat (1984) concluded that in hot environment mean egg weight and egg mass output were higher for Naked neck homozygotes than at cooler temperature Mean egg weight was also higher for this genotype At higher temperature Naked necks especially the homozygote (Na Na) birds utilised food more efficiently They also reported that at higher temperature age at first egg was 162 6 and 158 3 days respectively for Naked and normal neck (Na na and na na) birds Egg number upto 39 weeks was 73 4 and 70 9 and mean egg weight was 56 0 and 52 3 g for Naked neck (Na na) and normal neck (na na) birds respectively Fraga et al (1989) observed that average egg weight for Naked neck and normal neck birds were 61 4 and 59 9 g respectively

From the reports it is evident that the Naked neck birds performed better under hot environment and therefore it may be more suited to tropical environment than the normal neck variety

Materials and Methods

MATERIALS AND METHODS

An experiment was designed and carried out at the Centre for Advanced Studies in Poultry Science Kerala Agricultural University Mannuthy to evaluate the performance of Desi x exotic cross bred layers The experiment was commenced in October 1991 and terminated in March 1992 The experimental stock consisted of layers belonging to two crosses each of them a three way cross

Mating Procedure

The experimental birds were produced by mating desi (Naked neck) males with exotic two way cross females viz Austra White and New Rock (Plate 1 and II) The male birds were procured from farmers homesteads The Austra White and New Rock females were obtained from University Poultry Farm Mannuthy The Austra White was a cross involving Black Australorp and White Leghorns New Rock cross was produced by crossing New Hampshire and White Plymouth Rock breeds

The mating groups used for the production of experimental birds were as follows

1 Desi x Austra White

2 Desi x New Rock

Six males and 36 females were utilized for first cross (DAW) and six males and 48 females were utilized in the second

Plate I Naked neck desi male and New Rock female

Plate II Naked neck desi male and Austra White female

cross (DNR) Three consecutive hatches at eight days intervals were obtained from each cross

Incubation

The fertile eggs were gathered and stored for a period of seven days at a temperature of 15 20°C The hatching operations were carried out at University Poultry Farm Mannuthy and standard incubation practices were followed 495 chicks were obtained 221 in DNR cross and 274 in DAW cross All chicks were retained

Management

Day old chicks were wing banded and vaccinated against Ranikhet disease using RDF vaccine The chicks were reared on deep litter in a brooder cum rearing house and were provided with standard management upto 18 weeks of age At 8th week of birds were vaccinated against Ranikhet disease using R_2B vaccine At 18th week the pullets were transferred to layer house and were assigned to seven replicates in each cross

The details of birds utilised for present investigation are presented in the following table

Table 7 Replicatewise distribution of DNR and DAW crosses

Cross	Variety			
	Replicate	Naked neck	Normal neck	Total
DNR	R_1	8	8	
	R_2	7	7	
	R_3	6	7	
	R_4		6	
		21	28	49
DAW	R_1	8	7	
	R_2	7	7	
	R_3	6	7	
	R_4	6		
		27	21	48

The experimental period from 20 to 40 weeks of age was divided into five periods each of 28 days duration The following traits were recorded during each period

1 Body Weight

Body weight at four week intervals starting from 20 weeks was recorded individually to the nearest 10 g

2 Age at sexual maturity (Age at 50 per cent production)

The age in days at which each replicate attained 50 per cent production was recorded

6 Feed Efficiency

Feed efficiency for each replicate and treatment group were calculated as follows

$$\text{Feed efficiency} \quad \frac{\text{Feed consumption in kilogram}}{\text{No of dozens of eggs produced}}$$

7 Mortality

The mortality in each replicate was recorded in each period and autopsy was carried out on the dead birds

8 Plumage Colour and Egg Shell Colour

The plumage colour and egg shell colour in DNR and DAW crosses were recorded and were compared between each other

9 Broodiness

The number of broody hens and duration of broodiness was recorded in each cross

10 Egg quality

Egg quality traits viz egg weight shape index, albumen and yolk indices shell thickness and Haugh Unit Scores were recorded at 32 weeks of age Forty one eggs from DNR cross and 50 eggs from DAW cross were used for egg quality studies The eggs were kept at refrigeration temperature (5°C) for overnight

Sartorius

were measured

dth of yolk and

rs Other traits were

$$\frac{ch}{gth} \times 100$$

$$\frac{\text{Height of thick albumen}}{\text{Mean width of thick albumen}}$$

$$\frac{\text{Height of yolk}}{\text{Diameter of yolk}}$$

thickness was measured using Ame s shell thickness

g guage to the nearest 0 01 mm Haugh Unit Scores were

ded using Ame s tripod stand micrometer

Statistical Methodology

The mean and standard error were calculated as per Snedecor and Cochran (1967)

The data were analysed to test for significant differences, it any between crosses and the varieties by employing the following model

$$Y_{ijk} \quad \mu + C_i + V_{ij} + e_{ijk}$$

where Y_{ijk} observation on the k^{th} progeny of j^{th} variety in i^{th} cross

μ over all mean

C_i Effect of i^{th} cross (i 1 2)

V_{ij} Effect of j^{th} variety in i^{th} cross (j 1 2)

and e_{ijk} Random error normally and independently distributed with mean zero and variance σ^2

Computational form of ANOVA was as follows

Source	df	SS	MSS	F
Crosses	C 1	SS_C	MS_C	MS_C/MS_E
Varieties within crosses	V C	SS_V	MS_V	MS_V/MS_E
Progeny within varieties (Error)	N V	SS_E	MS_E	
Total	N-1			

where C Number of crosses

V Total number of varieties within crosses

N Total number progeny

$$SS_C \quad \Sigma \frac{Y_i^2}{n_i} \quad \frac{Y^2}{n}$$

$$SS_V \quad \Sigma \frac{Y_{ij}^2}{n_{ij}} \quad \frac{Y_i^2}{n_i}$$

$$SS_E \quad \Sigma Y_{ijk}^2 \quad \frac{Y_{ij}^2}{n_{ij}}$$

The variance ratio test (F test) was performed to test for significant differences as per Snedecor and Cochran (1967) The computed F value was compared with the table value at 5 per cent level of significance

RESULTS

The results of a study conducted to compare the egg production traits of two experimental cross bred groups from 20 to 40 weeks of age are presented in this chapter The two crosses were

1 Desi x (Australorp x White Leghorn) (DAW) and

2 Desi x (New Hampshire x White Plymouth Rock) (DNR)

The crosses consisted of Naked neck and normal neck birds The traits studied were body weight age at sexual maturity egg production egg weight feed consumption and efficiency plumage and egg shell colour broodiness and egg quality The results are presented in Table 8 to 23

Body Weight

The DNR cross recorded significantly higher ($P < 0.05$) body weight at all ages of measurement than DAW cross The mean body weight at 20 weeks of age was 1298 98 and 1007 29 g and at 40 weeks of age it was 1974 06 and 1445 36 g in DNR and DAW crosses respectively Naked neck and normal neck birds showed statistically similar body weight at 20 weeks of age both in DNR and DAW crosses A similar trend was also noticed for body weight at 24 28 32 and 36 weeks of age At 40 weeks of age the body weights in Naked neck and normal neck varieties were 1983 33

Table 8 Mean body weight in DNR and DAW crosses along with standard error

Cross	Variety	Age in weeks					
		20	24	28	32	36	40
DNR	Naked neck	1345 72 +49 83	1610 00 +94 69	1719 44 +79 41	1798 33 +68 9	1922 49 +69 95	1983 33 74 37
	Normal neck	1263 93 +49 56	1521 74 +71 75	1689 05 76 76	1784 50 80 8	1945 00 94 11	1965 88 99 33
	Mean	1298 98[a] +35 59	1561 67[a] +57 39	1710 00[a] 41 07	1791 05[a] +55 92	1931 47[a] +58 94	1974 06[a] 62 28
DAW	Naked neck	1047 41 +26 97	1228 90 +38 41	1338 64 +62 37	1379 50 +62 1	1420 53 +74 56	1450 56 78 05
	Normal neck	955 74 +34 48	1054 71 +55 31	1226 86 +63 63	1422 73 +80 16	1444 99 +97 96	1435 99 74 84
	Mean	1007 29[b] +22 16	1153 63[b] 34 18	1296 86[b] +46 13	1394 84[b] 48 48	1428 28[b] +58 39	1445 36[b] 55 99

Means bearing different superscripts within an age group differ significantly ($P \geq 0.95$)

Table 9 Mean squares from ANOVA for body weight

Source	20 weeks		24 weeks		28 weeks		32 weeks		36 weeks		40 weeks	
	df	MSS	df	MSS	df	MSS	df	MSS	df	MSS	df	MSS
Crosses	1	2 063015*	1	3 452629*	1	3 148483*	1	2 680128*	1	4 999082	1	4 174305
Varieties within cross	2	0 089790	2	0 187597	2	0 061681	2	0 007536	2	0 048479	2	0 001894
Error	93	0 042014	80	0 067664	70	0 070121	65	0 101037	60	0 113422	56	0 110958
Total	96		83		73		68		63		59	

* Significant ($P < 0.05$)

and 1965 88 g in DNR cross and 1450 56 and 1435 99 g in DAW cross respectively (Tables 8 and 9)

Age at Sexual Maturity

Age at sexual maturity (50 per cent production) in DNR and DAW crosses were 184 and 189 days respectively (Table 10)

Egg Production

(a) Hen Housed Number (HHN)

The hen housed egg number in DNR and DAW crosses are presented in Table 11 The HHN in DNR cross was 37 61 eggs whereas in DAW cross it was 34 40 This represented hen housed percentagess of 26 9 and 24 6 respectively in the two crosses The periodwise egg production particulars revealed that the DAW cross attained the maximum production during 33 36 weeks of age and DNR cross at 37 40 weeks

Naked neck birds registered higher ($P < 0\ 05$) egg number than their normal neck counterparts in DAW cross (Table 11) The Naked neck and normal neck birds in DNR cross recorded HHN of 42 76 and 33 75 eggs during 21 40 weeks of age In the DAW cross the figures were 42 26 and 22 0 respectively The Naked neck birds in DNR and DAW crosses had similar HHN (42 76 and 42 26 eggs)

Table 10 Age at sexual maturity (ASM 50 per cent production) in DNR and DAW crosses

Cross	Variety	ASM (days)
DNR	Naked neck	181 70
	Normal neck	185 80
	Mean	184 00
DAW	Naked neck	172 50
	Normal neck	211 00
	Mean	189 00

Table 11 Egg number (Hen housed) in DNR and DAW crosses

Cross	Variety	Age in weeks					Overall 21 40 weeks
		21 24	25 28	29 32	33 36	37 40	
DNR	Naked neck	1 19	9 74	12 22	13 78	13 75	42 76 (30 54)
	Normal neck	1 50	8 61	10 57	11 50	14 06	33 75 (24 11)
	Mean	1 37	9 12	11 33	12 58	13 91	37 61 (26 90)
DAW	Naked neck	1 29	9 68	14 39	14 40	10 81	42 26 (30 19)
	Normal neck	1 71	3 33	6 31	15 55	15 60	22 00 (15 1)
	Mean	1 38	7 62	11 47	14 81	12 28	34 40 (24 60)

Figures in the parantheses are hen housed percentages

Table 12 Egg number (Hen day) in DNR and DAW crosses

Cross	Variety	Age in weeks					Overall 21 40 weeks
		21 24	25 28	29 32	33 36	37 40	
DNR	Naked neck	1 22	10 02	12 22	14 77	13 87	50 42 (36 01)
	Normal neck	1 69	8 99	10 68	11 86	14 46	45 26 (32 33)
	Mean	1 48	9 46	11 39	13 21	14 18	47 61 (34 01)
DAW	Naked neck	1 30	9 99	15 12	15 1	12 84	53 82^{A} (38 44)
	Normal neck	1 81	3 00	6 85	15 60	15 60	34 86^{B} (24 90)
	Mean	1 39	8 04	12 19	15 26	13 79	47 81 (34 15)

Means bearing different superscripts within an age group differ significantly ($P \geq 0\ 95$)

Figures in the parantheses are hen day percentages

Table 13 Mean squares from ANOVA for egg number

Source	df	MSS	
		Hen housed egg number	Hen day egg number
Crosses	1	43 04883	1 724609
Varieties within cross	2	391 73735	379 82715*
Error	10	134 174	88 1959
Total	13		

Significant ($P < 0.05$)

(b) Hen Day Number (HDN)

The hen day egg number during 21 40 weeks of age (Table 12) were similar in both DNR and DAW crosses (47 61 and 47 81 eggs respectively) The peak production was observed during 33 36 weeks in DAW cross with HDN of 15 26 eggs whereas in DNR cross the maximum production was observed during 36-40 weeks of age (14 8 eggs)

The Naked neck birds had the advantage of a higher hen day egg number both in DNR and DAW crosses (Table 12) In DNR cross HDN from 21 40 weeks of age was 50 42 and 45 26 eggs in the Naked necked and normal neck varieties respectively In the DAW cross the corresponding figures were 53 82 and 34 86 respectively and this difference was significant ($P < 0\ 05$)

Egg Weight

The egg weight in DNR and DAW crosses for the different periods of study are presented in Table 14 The eggs of DNR cross were consistently heavier than that of DAW cross at all ages of measurement The initial egg weight was 36 67 + 0 81 g in DNR cross which progressively increased to 46 74 + 0 39 g at 37 40 weeks of age The DAW cross showed an initial egg weight of 36 25 + 0 67 g and a final egg weight 44 88 + 0 42 g The differences between these two crosses at all periods were statisti cally significant ($P < 0\ 05$) except at 21 24 weeks of age

Table 14 Mean egg weight in DNR and DAW crosses with standard error

Cross	Variety	Age in weeks				
		21-24	25 28	29 32	33 36	37 40
DNR	Naked neck	37 8 +0 65	42 06+0 38	45 89+0 32	47 43+0 72	47 4 +0 64
	Normal neck	35 32+0 96	41 26+0 62	44 69+0 35	46 14+0 28	46 24+0 35
	Mean	36 67+0 81	41 64+0 44[a]	45 29+0 24[a]	46 81+0 39[a]	46 74+0 39[a]
DAW	Naked neck	36 48+0 59	40 93 0 27	42 74+0 24	44 63+0 69	44 64+0 42
	Normal neck	37 61+0 64	39 27 0 44	43 33+0 38	44 74+0 32	45 19+0 91
	Mean	36 25+0 67	40 7 +0 24[b]	42 85+0 21[b]	44 67+0 47[b]	44 88 0 42[b]

Means bearing different superscript within an age group differ significantly ($P \geq 0\ 95$)

Table 15 Mean squares from ANOVA for Egg weight

Source	21 24 weeks		25 28 weeks		29 32 weeks		33 36 weeks		37 40 weeks	
	df	MSS	df	MSS	df	MSS	df	MSS	df	MSS
Crosses	1	8 386998	1	205 4784	1	1284 00	1	522 83	1	250 26
Varieties within cross	2	55 38992	2	94 39108	2	92 384	2	0 8084	2	95 879
Error	110	29 72865	659	26 04177	856	21 433	906	85 125	875	41 656
Total	113		662		859		909		878	

Significant (P < 0 05)

Among the two varieties in the DNR cross Naked neck group registered an egg weight of 47 4 + 0 64 g compared to 46 24 + 0 24 g in the normal neck variety at 37 40 weeks of age The egg weight in two varieties in both the crosses were statistically similar

Feed Consumption

Mean daily feed consumption (per bird per day) of the two crosses are set out in Table 16 The results revealed that the feed consumption is similar in both DNR and DAW crossess during 21 40 weeks of age (Table 18) In the initial period feed consumption per bird per day was 95 71 and 91 21 g respectively for DNR and DAW crosses which increased to 124 76 and 107 42g respectively during 37 40 weeks Within the crosses normal neck birds consumed more feed in DNR and DAW than Naked neck birds

Feed Efficiency

Feed efficiency during 21 40 weeks were 4 09 and 4 93 respectively for DNR and DAW crosses (Table 17) Naked neck birds showed better feed efficiency than normal necked variety in both DNR and DAW crosses The differences between the two varieties within DAW cross was statistically significant (Table 18)

Table 16 Mean daily feed consumption in DNR and DAW crosses

Cross	Variety	Age in weeks					Overall
		21 24	25 28	29 32	33 36	37 40	21 40 weeks
DNR	Naked neck	91 22	97 04	96 23	107 69	114 39	102 99 7 38
	Normal neck	99 08	95 67	100 15	113 79	133 53	109 32 +5 27
	Mean	95 71	96 29	98 34	110 9	124 76	106 61 +4 17
DAW	Naked neck	96 55	94 32	102 81	99 36	95 94	102 46 +9 08
	Normal neck	84 35	98 47	113 72	117 02	129 23	108 27 +3 84
	Mean	91 21	95 99	106 86	105 25	107 42	104 95 5 20

Table 17 Feed efficiency (feed per dozen egg) in DNR and DAW crosses

Cross	Variety	Age in weeks					Overall 20 40 weeks
		21 24	25 28	29 32	33 36	37 40	
DNR	Naked neck	24 72	3 26	2 65	2 36	2 71	3 70 +0 65
	Normal neck	17 6	3 36	3 16	3 24	3 06	4 38 +0 65
	Mean	20 26	3 39	2 90	2 79	2 89	4 09 +0 45
DAW	Nacked neck	24 99	3 17	2 2	2 23	2 47	3 08[A] +0 25
	Normal neck	44 6	12 29	5 96	2 58	2 81	5 42[B] +2 17
	Mean	30 00	4 73	2 95	2 36	2 6	4 93 1 2

Means bearing different superscripts within an age group differ significantly ($P \geq 0\ 95$)

Table 18 Mean squares from ANOVA for feed consumption and feed efficiency

Source	df	MSS	
		Feed consumption	Feed efficiency
Crosses	1	9 640625	0 0001
Varieties within crosses	2	63 273438	5 0695*
Error	10	173 9297	1 1191
Total	13		

* Significant ($P < 0\ 05$)

Mortality

Among the two crosses DAW showed higher mortality than DNR cross (Table 19) But the difference were not statistically significant (Table 20) The major causes of death were Marek s disease enteritis and hepatitis Eighty five per cent of mortality was attributed to Marek s disease Within the two crosses normal necked variety showed a higher mortality The highest mortality occured during 21 24 weeks in DNR cross and during 25 28 weeks in DAW cross

Plumage Colour and Egg Shell Colour

The plumage colour in DAW cross were black greyish white with scarce black patches and grey (Plate III) In DNR cross the birds were multicoloured red brown black and white and their combinations Different plumage patterns were also observed (Plate IV) The egg colour of DNR cross was brown but most of the eggs in DAW cross were tinted

Broodiness

Broodiness was observed in both the crosses and the period of broodiness in the birds were 25 30 days Ten birds out of 48 in DAW cross and 11 birds out of 49 in DNR cross showed broodiness during the period of study (21 to 40 weeks)

Plate III DNR cross females

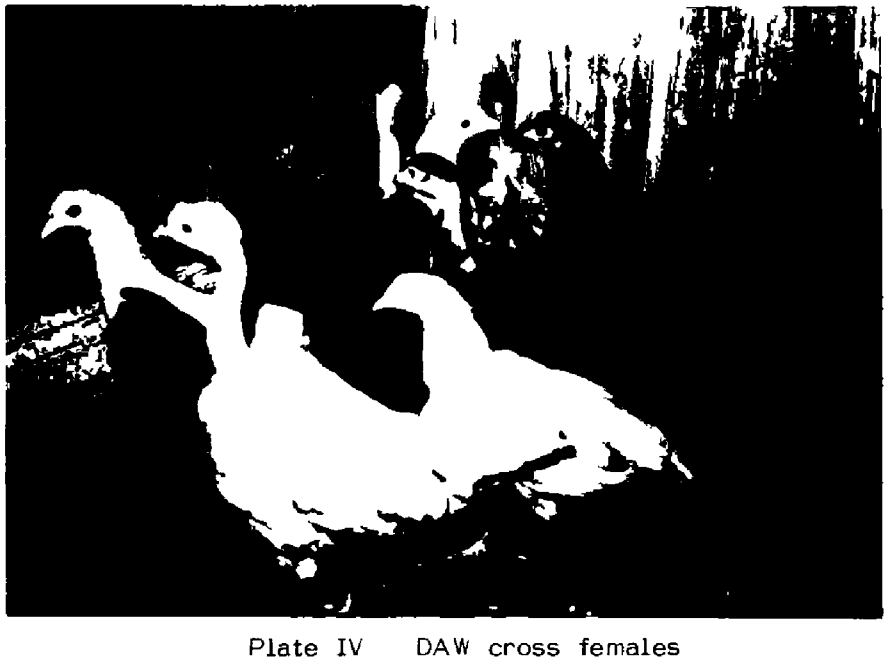

Plate IV DAW cross females

Table 19 Mortality (per cent) in DNR and DAW crosses

Cross	Variety	Age in weeks					Overall 21 40 weeks
		21 24	25 28	29 32	33 36	37 40	
DNR	Naked neck	9 52	5 0		11 11	6 25	23 81
	Normal neck	17 86	16 67	5 0	10 53	5 88	35 71
	Mean	12 5	9 52	2 63	10 81	6 06	30 61
DAW	Naked neck	7 41	12 0	9 9	5 0	4 55	25 93
	Normal neck	19 05	23 53	15 38	9 09		52 38
	Mean	12 5	16 67	11 43	9 68	3 13	37 5

Table 20 Mean squares from ANOVA for mortality (21 40 weeks) (Transferred data)

Source	df	MS
Crosses	1	95 99414
Varieties within cross	2	192 95022
Error	10	91 72656

Egg Quality

Egg quality traits were measured at 32 weeks of age and the results are set out in Table 21 The shell thickness and Haugh Unit Scores were 0 396 and 86 respectively in DNR cross and 0 403 and 85 respectively in DAW cross However the differences between crosses in these traits were statistically non significant The Shape Index Albumen Index and Yolk Index did not show any difference between the crosses (Tables 22 and 23)

The Naked neck and normal neck varieties were also similar for all the egg quality traits except shell thickness in DAW cross Shell thickness was significantly higher ($P < 0\ 05$) in normal neck variety of DAW cross than their Naked neck counter parts All the eggs showed excellent quality

Table 21 Egg quality traits in DNR and DAW crosses at 32 weeks of age

Cross	Variety	Egg weight (g)	Shape Index	Albumen Index	Yolk Index	Shell thickness	Haugh Unit
DNR	Naked neck	48 24	74 31	0 115	0 486	0 40	89
	Normal neck	46 76	76 30	0 110	0 483	0 39	83
	Mean	47 44[a]	75 38	0 113	0 485	0 396	86
DAW	Naked neck	44 03	76 48	0 099	0 474	0 40[A]	84
	Normal neck	45 54	76 42	0 112	0 481	0 42[B]	89
	Mean	44 39[b]	76 47	0 103	0 476	0 403	85

Means bearing different superscripts within a column differ significantly ($P \geq 0\ 95$)

Table 22 Mean squares from ANOVA for egg weight shape index and shell thickness

Source	df	MSS		
		Egg weight	Shape Index	Shell thickness
Crosses	1	209 340	26 754	0 0009
Varieties within cross	2	21 477	20 144	0 0020*
Error	87	20 347	15 316	0 0060
Total	90			

Significant ($P < 0\ 05$)

Table 23 Mean squares from ANOVA for Albumen Index Yolk Index and Haugh Unit

Source	df	MSS		
		Albumen Index	Yolk Index	Haugh Unit
Cross	1	0 0020	0 0016	10 312
Varieties within cross	2	0 0007	0 0002	283 040
Error	84	0 0007	0 0009	143 730
Total	87			

Discussion

DISCUSSION

The results obtained in a study to evaluate the egg production performance of three way crosses obtained utilising Naked neck desi as sire line and Austra White and New Rock as the dam lines is discussed in this chapter

Body Weight

Data on body weights revealed that DNR cross was significantly heavier ($P < 0.05$) than DAW cross at 20 weeks of age (1298.98 Vs 1007.29 g) This trend continued to exist till 40 weeks of age These differences in body weight could be attributed to the breeds employed in the formation of the female lines While the Austra White was a light weight bird the New Rock was of medium body size According to Nair (1991) the mean body weight recorded at 20 weeks of age were 1172 and 1689 g and 40 week body weights were 1352 and 2009 g in Austra White and New Rock females respectively Desi birds are light in body size (Sah et al 1984 and Jain and Chowdhury 1985) These inherent differences in body weights in dam lines has reflected in the body weight of the crosses studied The 40 week body weights in DNR and DAW crosses were 1974.06 and 1445.36 g respectively revealing a difference of 529 g between the crosses A medium sized bird may be more favourable under backyard condition as

it fetches a higher return when the birds are disposed for meat purpose The fact that DNR cross gained 675 g against 438 g in DAW cross revealed a faster growth in DNR cross during the period from 21 40 weeks of age This amount of weight gain may not be desirable in layers under intensive rearing but is not totally undesirable in birds under backyard conditions

The 20 week body weight observed in the present study in DNR cross is comparable with those reported by Jain and Chowdhury (1985) in three way crosses involving desi Rhode Island Red and White Leghorn Radhakrishnan and Ramakrishnan (1982) also reported comparable body weight at 20 weeks of age in cross bred chickens Forty week body weight obtained in the present study were similar to those reported by Huq et al (1976) and Radhakrishnan and Ramakrishnan (1982) for cross-breds

In the present study Naked neck and normal neck progenies were obtained in each cross which revealed that the male parents used were heterozygous for Naked neck gene A comparison between the two varieties revealed that body weights measured at all ages (Table 8) were not significantly different between varieties within the crosses Monnet et al (1982) had observed that although body weight were heavier for Naked neck birds at 18th week (reared at 31°C), the differences decreased with age and were not significant from 27 week onwards However Bordas et al (1982)

reported a significant lower body weight for homozygous Naked neck birds at 30 weeks of age Therefore the Naked neck gene does not seem to have much influence on body weight at the adult stage This is also evidenced by the results obtained in this study

Age at Sexual Maturity

The data on age at sexual maturity (Table 10) revealed that ASM in both the crosses were similar but were late compared to commercial layers Such a trend was not totally unexpected since the experimental birds were 50 per cent desi cross breds Desi birds are inherently late maturing as reported by Chapel (1951) Acharya and Kumar (1978) Kumar and Acharya (1980) Sah et al (1985) and Thomas and Rao (1988) Radhakrishnan and Ramakrishnan (1982) reported age at maturity as 171 days in Austra White Pullets produced from same strains were used in the present study Crossing Austra White with desi has further delayed the age at maturity to 189 days The New Rock and Austra White parents utilised in this experiment had recorded an age at maturity of 194 and 184 days respectively (Leo 1991) Cross breeding with desi males has reduced the age at maturity in DNR cross by 10 days whereas in DAW cross it has been increased by five days The variation in age at maturity between the two crosses could be due to the differences in body weights at 20 weeks

Among the Naked neck and normal neck varieties the former appeared to be early maturing compared to latter (Table 10) This difference was more evident in DAW cross (172 50 and 211 days respectively) The delay in maturity in normal neck variety has consequently resulted in lower egg number (Table 11) Detailed study with a large population size is required to bring to these differences more definitely

Egg Production

a) Hen Housed Number

Hen housed egg number in DNR and DAW crosses as presented in Table 11 revealed that crosses were statistically comparable in respect of this trait upto 40 weeks of age (37 61 and 34 40 respectively) With the observed part year production an annual egg number of 120 130 could be expected Austra White bird had registered a performance of 53 eggs (hen housed) under field conditions upto 40 weeks of age (Radhakrishnan and Ramakrishnan 1982) According to Leo (1991) Austra White and New Rock birds had recorded hen housed egg number of 70 and 66 9 respectively upto 40 weeks of age The fact that DNR and DAW crosses fell short of this number might be due to the inheritance of 50 per cent desi germplasm in the crosses Dascula et al (1964) reported an egg number of 130 5 in New Hampshire x local for one year

of production while Sah et al (1985) reported an egg number of 32 09 in desi x White Leghorn cross upto 240 days of age whereas its reciprocal cross yielded 26 82 eggs The introduction of 50 per cent desi germplasm in these crosses might have decreased the egg production potential of the crosses though the breeds of female lines had a higher egg production potential Therefore it seemed that the level of inheritance of desi germplasm is on the higher side and it may be brought down by further crossing Alternatively the desi flock may be refined by selection for egg number and the improved males can be used for cross breeding As the DNR and DAW had comparable egg numbers the choice of better cross has to be made on the basis of other production traits

The Naked neck variety in both crosses apparently registered a higher egg number than their normal neck counterparts This indicated a better egg production potential for the Naked neck variety. However a detailed study using larger flock size for a longer duration is required to draw definite conclusions The lower egg number in the normal neck variety might be a sequel to their delayed age at maturity The normal neck birds also had a lower body weight at 20 weeks of age All these factors might have contributed for the lower egg number in this group The results of present study are in agreement with that of Bordas and Merat (1984)

b) Hen Day Number

Hen day egg number in the two crosses followed a similar pattern as that of hen housed number The number of eggs laid by the crosses were similar (Table 12) which indicated a comparable production potential Introduction of 50 per cent desi germplasm in the two crosses appeared to have caused a drop in the egg number compared to their female parents which were 66 9 and 70 eggs in New Rock and Austra White respectively (Leo 1991) Therefore it may be advantageous to maintain a lower level of desi inheritance in the crosses Alternatively selective breeding can be employed in the desi flock as suggested previously

The Naked neck variety in both DNR and DAW crosses exhibited an improved egg number compared to the normal neck birds This difference was statistically significant in the DAW cross (Table 12 and 13) The DNR cross showed a difference of five eggs between varieties whereas the difference was 19 eggs in the DAW cross This suggested that rearing Naked neck layers is likely to yield better returns Bordas and Merat (1984) did not observe any difference between the two varieties

Egg Weight

Egg weight in the two crosses were comparable during the first period (Table 14 and 15) But it showed significant differences

in the later periods At 37 40 weeks of age eggs from DNR cross were heavier by 1 86 g compared to the eggs from DAW cross While the egg weight increased by 10 7 g from 20 to 40 weeks of age in DNR cross the DAW registered an increase of 8 63 g only It may also be noted that the DNR cross had the advantage of a higher body weight Egg weight in the parent lines New Rock and Austra White were 47 83 and 49 68 g respectively at 40 weeks of age (Leo 1991) After cross breeding with desi males egg weight has been maintained in the DNR cross while it declined substantially in the DAW cross The inherent low egg weight in desi birds (Kumar et al 1971 Aggarwal 1972 Jain et al 1978b Kumar and Acharya 1980 Mahapatra et al 1983 Sah et al 1985 and Thomas and Rao 1988) might have resulted in this reduction in egg weight As egg weight is also a limiting factor in desi birds a 50 per cent desi inheritance might not be desirable and it may be brought down This might enable the constituent exotic breeds which have a higher egg weight potential to induce a better egg weight The results obtained for this trait is lower than those reported in 50 per cent desi cross breds (Kumar et al 1971 Jain et al 1978b and Omeje and Nwosu 1986)

Comparison of egg weight in Naked neck and normal neck varieties did not reveal any significant differences between them at all ages of measurement This suggested that Naked neck gene has no direct influence on egg weight Apparently maximum gain

in egg weight from 20 to 40 weeks of age was observed in normal neck variety in the DNR cross (10 92 g) The results of present study are not in agreement with the reports of Bordas and Merat (1984) and Merat (1980) who observed higher egg weight in Naked neck variety

Feed Consumption

The data on mean daily feed consumption (Table 16) revealed non significant difference between the crosses for this trait This was unexpected since the DNR cross being heavier should have consumed more feed A similar feed consumption might have resulted either due to the better feed conversion ability of DNR cross or because of the poor feed conversion ability of the DAW cross Period wise feed consumption data showed a linear trend in DNR cross while it was not linear in DAW cross The feed consumption was lower during 33 to 36 weeks compared to previous period The fact that eight hens were broody in DAW cross could have resulted in the reduction in feed consumption in this cross However this was not observed in DNR cross where the number of broody hens were five

The feed consumption observed in the study is lower than those reported by Aggarwal and Sapra (1972) in desi and other Indian breeds but similar to those reported by Al Soudi and Al Jebouri (1979)

The comparison of the feed consumption between the two varieties Naked neck and normal neck revealed an apparent lower feed consumption in the Naked neck variety in both the crosses (Table 16)

Feed Efficiency

A perusal of the feed efficiency (feed per dozen egg) in the two crosses (Table 17) revealed that the birds of DNR (4 09) and DAW (4 93) crosses did not show much difference for this trait The best feed efficiency could be noticed during 33 to 36 weeks of age in both crosses and this coincided with peak egg production in DAW cross

However when feed efficiency trait was considered in the varieties the picture was different The Naked neck and normal neck varieties were significantly different for this trait only in DAW cross where the former registered a better efficiency (3 08 and 5 42) It may also be noted that the hen day egg production was also significantly different in the two varieties in DAW cross A higher egg production in Naked necked birds has resulted in a better feed efficiency The poor feed efficiency in normal neck birds is also attributable to late onset of sexual maturity The absence of such an effect in DNR cross precludes from arriving at valid conclusion as to the influence of the Naked neck gene

Mortality

Mortality rate in both the crosses were higher than the optimum in all periods of study The major cause of mortality (85 per cent) was Marek s disease in both the crosses The experimental birds were not vaccinated against Marek s disease as the incidence of this disease in the University Poultry Farm was very low The mortality was highest during the first period and showed a declining trend as the age advanced The disease affected the two crosses equally The disease resistance capability of desi birds was not evident against Marek s disease The high incidence of Marek s disease influenced undesirably the production traits in both the crosses Detailed study is essential in this regard

The mortality percentages in the experiment were higher in both DNR and DAW crosses (30 61 and 37 5 respectively) than those reported by Huq et al 1976 and Al Soudi and Al Jebouri, 1979 But the mortality rate is comparable to those reported by Sah et al (1984)

Among the varieties there was an apparently lower incidence of mortality in the Naked neck variety (Table 19) However statistical analysis did not reveal any significant differences As the flock size is small this may be considered only as an indication of a better livability in Naked neck variety Detailed

studies using large flock size is required to arrive at valid conclusion

Plumage Colour and Egg Shell Colour

In the present study DNR cross exhibited various plumage colours like white buff brown black and their various combinat ions But progeny in DAW cross were either black greyish white with black patches or grey In the DNR cross colour genes inherited from from New Hampshire White Plymouth Rock and the desi males have been expressed in the progeny But in DAW cross the dominant, white gene from White Leghorn and dominant black gene from Black Australorp have influenced the plumage colour in the progeny though they had 50 per cent desi inheritance with coloured plumage As the farmers prefer multicoloured birds for backyard rearing the DNR cross had an advantage over DAW cross in respect of this trait

The egg shell colour is of importance in the marketing strategy as brown shelled eggs fetches a premium price The two crosses evaluated in the present study exhibited different shell colours While the DNR cross laid brown eggs the DAW cross laid tinted eggs This is an added advantage which makes the DNR cross more favourable than the DAW cross

Broodiness

Broodiness has been eliminated from most of the exotic breeds by selective breeding This may be advantageous where all the requirements for chick production are met with help of incubators But under backyard conditions most of the farmers hatch out their replacement stock using broody hens Therefore, total elimination of broodiness from birds reared under backyard conditions might be disadvantageous In the present study both the DNR and DAW crosses exhibited broodiness Though 50 per cent inheritance in female side were from nonbroody breeds 20 per cent of the progeny exhibited broodiness which was lasting about 25 to 30 days Broody hens stopped egg production and consequently the egg yield from the flock was affected Introduction of desi germplasm might have caused broodiness to the extend observed in this study Minimising the desi inheritance might be advantageous in lowering this trait

Egg Quality Traits

Egg quality traits as presented in Table 21 did not reveal any significant difference between the crosses except for egg weight Egg weight was significantly higher in DNR cross Other traits like Shape Index Albumen Index Yolk Index Shell thickness and Haugh Unit Scores in both the crosses were of comparable magnitude However in DAW cross normal neck variety showed

significantly higher shell thickness (0 42 mm) than Naked neck birds (0 40 mm) When the data were compared with USDA standards, the egg quality was found to be excellent in both crosses The egg shell thickness observed in the present study is higher than those reported in White Leghorns (Anon 1992) The ability of desi and desi crosses to lay thick shelled eggs have been reported by Kumar et al (1971) Jain et al (19/8a), Kumar and Acharya (1980) and Mahapatra et al (1983)

The over all performance of DNR and DAW crosses from 21 to 40 weeks of age (Table 24) revealed that the two crosses were similar in hen housed and hen day egg number age at sexual maturity, mean daily feed consumption and livability The egg quality traits were also comparable in the two crosses The DNR cross however had a higher body weight and egg weight and better feed efficiency They also had the advantage of multicoloured plumage and brown shelled eggs Considering all the quantitative and qualitative traits, DNR cross appears more promising than DAW cross as a bird for the backyard

The Naked neck variety exhibited a favourable trend in performance compared to the normal neck birds for egg number, feed consumption feed efficiency and livability This suggests that Naked neck variety may be a more suitable variety than the normal neck birds

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Table 24 Overall performance of DNR and DAW crosses from 21 to 40 weeks of age

Sl No	Traits	Desi x New Rock (DNR)	Desi x Austra White (DAW)
1	Number of birds housed	49	48
2	Body weight 20 weeks (g)	1298 98 + 35 59[a]	1007 29 + 22 16[b]
3	Age at sexual maturity (50% production) (days)	184 00	189 00
4	Body weight 40 weeks (g)	1974 06 + 62 28[a]	1445 36 + 55 99[b]
5	Hen housed egg number	37 61	34 40
6	Hen housed per cent	26 90	24 60
7	Hen day egg number	47 61	47 81
8	Hen day per cent	34 01	34 15
9	Mean egg weight (37 40 weeks) (g)	46 74 + 0 39[a]	44 88 + 0 42[b]
10	Mean daily feed consumption (g)	106 61 + 4 17	104 95 + 5 20
11	Feed efficiency (feed/ dozen eggs)	4 09 + 0 45	4 93 + 1 20
12	Mortality (per cent)	30 61	37 5
13	Plumage colour	Multicoloured	Black White grey
14	Egg shell colour	Brown	Tinted
15	Number of broody hens (21 to 40 weeks)	11/49	10/48
16	Egg quality		
	Shape Index	75 38	76 47
	Albumen Index	0 113	0 103
	Yolk Index	0 485	0 476
	Shell thickness	0 396	0 403
	Haugh Unit score	86 00	85 00

The following suggestions were made

1 The DNR cross may be tested as a backyard bird under field conditions

2 The Naked neck variety may be further evaluated for the production traits on a larger population

3 To improve the performance of the DNR cross, selective breeding may be practised in desi and New Rock flocks Desi inheritance in the DNR cross may be brought down so that the undesirable influence of the desi stock on the production traits may be minimised

1

Summary

SUMMARY

An experiment was conducted at Centre for Advanced Studies in Poultry Science Kerala Agricultural University Mannuthy to evaluate two groups of desi x exotic cross breds for egg production traits Naked neck birds procured from farmers were used as male line in this experiment Two exotic cross breds available at the University Poultry Farm viz Austra White (Australorp x White Leghorn) and New Rock (New Hampshire x White Plymouth Rock) were the female lines used Data from 97 progeny belonging to the two crosses were collected from 20 to 40 weeks of age with the following objectives

1 To evaluate the two cross bred groups viz desi (D) x Austra White (AW) and desi (D) x New Rock (NR) based on egg production traits for the part year period and
2 to study the influence of Naked neck gene on egg production traits

Forty nine birds belonging to DNR and 48 birds in DAW cross were utilized for assessing egg production traits from 21 to 40 weeks The birds included both Naked neck and normal neck birds in each cross Standard managemental practices were followed throughout the experimental period The production traits measured were body weight age at sexual maturity egg number egg weight feed consumption feed efficiency mortality, plumage

colour egg shell colour broodiness and egg quality Data were analysed by employing appropriate statistical methodology The following results were obtained in this study

1 The mean body weight at 20 weeks of age for the DNR and DAW crosses were 1298 98 and 1007 29 g and the corresponding values at 40 weeks of age were 1974 06 and 1445 36 g respect ively The differences in body weights between the crosses at all ages were statistically significant ($P < 0\ 05$) The body weights in Naked neck and normal neck varieties in both crosses were comparable at all stages of measurement

2 The mean age at sexual maturity measured as age at 50 per cent production was 184 and 189 days respectively in DNR and DAW crosses Within the crosses the naked neck variety showed apparently lower age at maturity

3 The mean hen housed egg number from 21 40 weeks of age was 37 61 and 34 4 for DNR and DAW crosses respectively and the difference between the two crosses was not satistically significant The Naked neck variety showed apparently higher hen housed egg number in both the crosses

4 The mean hen day egg number during 21 40 weeks of age was similar in both crosses the values being 47 61 and 47 81 eggs respectively in DNR and DAW crosses The Naked neck variety showed higher hen day number in both the crosses and the

difference between the two varieties was statistically significant in DAW cross ($P < 0.05$)

5 The peak production was attained at 33 36 weeks in DAW cross and 37 40 weeks in DNR cross

6 The eggs of DNR cross were significantly heavier ($P < 0.05$) than DAW cross at all stages of measurement except at the initial period The initial egg weight at 21 24 weeks of age was 36 67 and 36 25 g in DNR and DAW crosses and it progressively increased to 46 74 and 44 88 g in DNR and DAW crosses at 37 40 weeks of age respectively Naked neck and normal neck varieties showed statistically similar egg weight in both the crosses

7 The mean daily feed consumption in DNR and DAW crosses was comparable and the normal neck variety in both the crosses consumed more feed than Naked neck counterparts However the differences were statistically non significant

8 Feed efficiency in DNR and DAW crosses were statistically similar In both crosses Naked neck variety showed apparently better feed efficiency and the differences between the two varieties in DAW cross were statistically significant ($P < 0.05$)

9 The mortality per cent was comparable between the two crosses and between the two varieties within crosses However DNR

cross was apparently more viable The Naked neck variety showed lower mortality than normal neck birds in both the crosses

10 Plumage colours in DAW cross were black greyish white with black patches and grey However in DNR cross birds were multicoloured with different feather patterns Egg shell colour was brown in DNR cross and tinted in DAW cross

11 Broodiness was observed in both the crosses and duration of broodiness ranged from 25 to 30 days

12 Egg quality traits such as Shape Index Albumen Index Yolk Index and Haugh Unit were statistically comparable in both crosses Shell thickness was similar in Naked neck and normal neck varieties in DNR cross whereas in DAW cross normal neck birds showed significantly higher shell thickness ($P < 0.05$)

Considering the small population size used in the study, though it will be hazardous to draw very definite conclusion in a breeding experiment of this nature the trend of results did show that DNR cross is superior over DAW cross for use in home stead poultry production system The results also revealed that Naked neck is a promising variety for exploitation in the backyard system Further experiments in a larger population under farm and field conditions are needed before recommending this cross for adoption by farming community

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PERFORMANCE OF *DESI* X EXOTIC CROSS-BRED LAYERS

By

M. V. JAYANTHY

ABSTRACT OF A THESIS

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Kerala Agricultural University

Department of Poultry Science
COLLEGE OF VETERINARY AND ANIMAL SCIENCES
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ABSTRACT

Data were collected on egg production performance of two cross breds viz desi x Austra White (DAW) and desi x New Rock (DNR) from 20 to 40 weeks of age The birds in each cross consisted of Naked neck and normal neck varieties DNR cross birds were significantly heavier at 20 and 40 weeks of age than DAW cross birds (1298 98 and 1007 29 Vs 1974 06 and 1445 36) The body weight in Naked neck and nomal neck varieties were comparable in both crosses Age at sexual maturity was 184 and 189 days in DNR and DAW crosses, respectively Hen housed and hen day egg numbers were similar in both crosses (37 61 and 47 61 Vs 34 40 and 47 81) while the Naked neck birds in both crosses showed higher hen housed and hen day egg number than normal neck birds The difference in hen day egg number between the varieties in DAW cross was significant (53 82 Vs 34 86) The eggs were signifi cantly heavier in DNR cross than in DAW cross (46 74 Vs 44 88) whereas the varieties within both crosses laid eggs of similar size The mean daily feed consumption and feed efficiency were also similar in both crosses (106 61 g and 4 09 Vs 104 95 g and 4 93) In DAW cross the Naked neck birds registered a better feed efficiency While DNR birds were multicoloured and laid brown eggs DAW crosses consisted of only black greyish white with black patches and grey birds which laid tinted eggs Broodiness

was observed in both the crosses Egg quality was excellent in both the crosses and varieties within crosses at 32 weeks of age Livability was also similar in both crosses though it was poor Considering the overall performance the DNR crosses was adjudged as a better cross for the backyard