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GENETIC STUDIES TO IMPROVE PRODUCTIVE PERFORMANCE OF LAYING HYBRIDS BY SINGLE GENES. 1- MEAT PRODUCTION FROM MALES OF DIFFERENT GENOTYPES

H. Younis, T. M. El- Sayed and K. Saleh

Department of Poultry Production, Faculty of Agriculture, Tanta University, Kafr El-Sheikh, Egypt

SUMMARY

Three experiments were conducted to test the performance of male chicks from commercial medium-type brown layers (Dahlem Red) with different genotypes involving naked neck (Na), Frizzle (F) and rate of Feathering (K) genes.

The results showed that body weight at 15 weeks of age was heavier for the naked neck birds as compared with normal birds in the second experiment, while the difference was not clear in the first and third experiments. However, the naked neck gene had more pronounced effects on carcass traits through reducing feather%, skin% and total fat% (skin plus abdominal fat) and increasing meat yield% and edible parts%.

On the other hand, the effect of frizzle gene was not clearly observed on growth performance, while it was clear on skin % and total fat % in the first and third experiments whereas the frizzle birds had higher fat deposition when compared to normal birds.

Moreover, the slow feathering gene improved edible parts% and meat yield%, decreasing skin% and total fat%. Also, there were no significant interaction effects among the Na, K and F genes on growth performance and carcass traits except the interaction between Na × K and Na × K × F for total fat which was significant ($P \leq 0.05$).

The results generally demonstrated that introducing the three genes (Na, K and F) or at least the first two is expected to impove the carcass quality of the males of the commercial brown-egg layers which help in exploiting the huge number of them in meat production.

Keywords: Poultry, body weight, feather weight, carcass yield, naked neck, rate of feathering and frizzle

INTRODUCTION

Through the production of commercial Layers, high numbers of day-old male chicks also are produced and considered as by-product without significant value. Therefore, the exploity of these male chicks for meat production specially in the developing countries will be a good approach. However, the male must exceed the economical limit of growth in order to be used efficiently for meat production.

The intensive studies concerning some single genes in chickens showed that beneficial effects could be obtained through introducing one or more of such genes to the genome of the birds. The main effect of naked neck gene (Na) is the reduction of the whole feather mass either absolute or relative to live body weight by about 20-30-% as compared with normal chicken (Crawford, 1976; Zein El-Dein *et al.*, 1984; Merat, 1986; Horst *et al.*, 1986; Manner, 1992; Cahaner *et al.*, 1993 and Younis, 1996). In addition, body weight in naked neck birds was larger than that in normally feathered ones (Bordas *et al.*, 1978 ;Cahaner *et al.*, 1993; Younis, 1996 and Saleh and Younis 1997). One of the important advantage of naked neck gene is the improvement of carcass traits not only through reducing total fat (skin and abdominal fat) but also through increasing meat yield either absolute or relative to live body weight (Monnet *et al.*, 1979; Hanzl and Somes, 1983 ; Zein El-Dein *et al.*, 1984; El-Attar and Merat, 1985; Merat, 1986 and 1990; Cahaner *et al.*, 1993; Younis, 1996 and Saleh and Younis, 1997).

On the other hand, introducing slow feathering gene (K) in broiler could improve both body weight and feed conversion and decrease mortality percentage (Lowe and Merkley 1986 and Ajang *et al.*, 1993). Moreover, the frizzle gene (F) caused a reduction of feathering intensity (feather weight at slaughter) for more than -60% (Haaren-kiso *et al* ., 1992) the interaction among genes showed significant effects on some productive traits (Mathur and Horst, 1992).

The aim of this study was to test the performance of male chicks from commercial middle-type brown layers (Dahlem Red) with different genotypes when used for meat production under Egyptian conditions.

MATERIALS AND METHODS

The experiments were carried out at the Poultry Research Unit farm, Department of Poultry Production, Agriculture College, Kafer El-Sheikh, Tanta University.

Three separate experiments were conducted in this study, first experiment included 224 one day-old Dahlem male chicks from four genetic groups (Nana Ff, Nana ff, nana Ff, nana ff), the second experiment included 264 one day-old Dahlem male chicks from four genetic groups (Nana Kk, Nana kk, nana Kk and nana kk), while in the third experiment 310 one day-old Dahlem male

chicks from eight genetic groups (Nana Kk Ff, Nana Kk ff, Nana kk Ff, Nana kk ff, nana Kk Ff, nana Kk ff, nana kk Ff and nana kk ff) were used. The chicks were produced through the mating between heterozygous (Nana Kk Ff) males and normal (nana k- ff) females in order to get full- sib families of offspring segregating for four or eight genotypes. First and third experiments were conducted at modrate temperature while the second experiment was carried out during summer season.

In each experiment, all chicks were wing-banded at hatch and raised under conventional open- sided houses until they reached 15 weeks of age. These houses were provided with wheat hulls as litter, the ambient temperature was about 35 °C in the first week of age then it was lowered 3 °C weekly until it reached to the natural ambient temperature, under a good circulating air.

Feed and water were supplied *ad libitum* throughout the experiments and the chicks were fed a starter diet containing 21.3% crude protein and 3000 k.cal ME/kg from hatch to 6 weeks of age , and from 7 to 15 weeks of age a finisher diet containing 18% crude protein and 3000 k. cal ME/kg was offered. Chicks were individually weighed at hatch, 10 and 15 weeks of age.

At 15 weeks of age after the final body weight 15 males per genetic group were randomly taken and sacrificed by severing the jugular vein, feathers were machinery removed with some hand plucking necessary to insure complete defeathering, and weighed to determine fresh feather weight. Abdominal fat was removed from around gizzard, proventriculus and cloaca, skin was removed from the entire carcass except wings, head, neck and shanks of each bird weighed, breast and thigh meat were dissected and weighed.

The data from each experiment were statistically analyzed according to SAS program (SAS institute, Inc., 1985) based on the following model including the main effects as well as the interactions among them:

$$Y_{ijkl} = \mu + N_i + K_j + F_k + (NK)_{ij} + (NF)_{ik} + (KF)_{jk} + (NkF)_{ijk} + e_{ijkl}$$

where :

Y_{ijkl} was the observed value of the i th naked neck, j th rate of feathering and k th frizzle genotype, μ was the overall mean, N_i was the fixed effect of the i th naked neck gene, K_j was the fixed effect of the j th rate of feathering gene, F_k was the fixed effect of the k th frizzle gene, $(NK)_{ij}$ was the interaction effect of the naked neck gene with the rate of feathering gene, $(NF)_{ik}$ was the interaction effect of the naked neck gene with the frizzle gene, $(KF)_{jk}$ was the interaction effect of the rate of feathering gene with the frizzle gene , $(NKF)_{ijk}$ was the interaction effect of the naked neck gene with the frizzle gene with the rate of feathering gene and e_{ijkl} was the random error. The main effect of gene was estimated after Katongole *et al.*, 1990.

$$\text{Na gene effect \%} = \frac{\text{(average of naked neck birds - average of normal birds)}}{\text{average of normal birds}} \times 100$$

RESULTS AND DISCUSSION

First experiment

The results tabulated in Table 1 showed no significant differences among the four genetic groups in most studied growth traits, except in the period between hatch and 10 weeks of age at which the normal genotype (nana ff) showed some advantages (about 3 and 6%) in body weight at 10 weeks and weight gain in this period compared with the naked neck (Nana ff) and the naked neck - frizzle (Nana Ff) genotypes.

The former observations are not in harmony with those obtained by (Bordas *et al.*, 1978; Cahaner *et al.*, 1993; Younis, 1996 and Saleh and Youis 1997), who reported that the body weight in naked neck broilers was larger than that in normal feathered ones.

The effect of naked neck gene was pronounced on carcass traits (Table 2) whereas there were statistically significant differences ($P \leq 0.01$) between naked neck and normal birds for feather% and carcass%. The feather percent was lower in the two naked neck genotypes (Nana Ff and Nana ff) by 14 and 12.74 % respectively. On the other hand, the proportion of carcass in the two naked neck genotypes was higher than in the normal genotype (nana ff) by about 2.67%.

The proportion of abdominal fat, skin and total fat were reduced by naked neck gene by 11.56%, 8.41% and 9.03%, respectively. There were significant differences ($P \leq 0.05$) between naked neck and normal birds.

The proportion of meat yield and edible parts were also increased by the Na allele by 4.27% and 2.63% respectively, when compared with normal birds.

These results are in agreement with those reported by (Monnet *et al* ., 1979; Hanzl and Somes, 1983, Zein El-Dein *et al.*, 1984, El-Attar and Merat, 1985; Merat, 1986 and 1990; Cahaner *et al.*, 1993; Younis, 1996 and Saleh and Younis, 1997), the naked neck gene improved carcass traits through increasing meat yield and reducing feather percentage and total fat (skin and abdominal fat).

Carcass traits were not affected by the frizzle gene except the proportion of skin and total fat which were significantly higher in the frizzle birds compared with the normal birds ($P \leq 0.05$).

The gene interaction (Na and F) had no significant influence on growth performance and carcass traits. However, frizzle birds in both naked neck and normal genotypes had less feather percentage by about 1.45% and 4.79% , respectively. Haaren- kiso *et al*, 1992 reported that the frizzle gene (F) caused a reduction of feathering intensity for more than - 60%.

Table 1. Summary of growth performance of the first experiment as affected by naked neck and frizzle genes

Trait	Age	mean values of genes				Deviation from nana ff (% of nana ff)			Significance			Effect of the gene (%)	
	(week)	Nana Ff	Nana ff	nana Ff	nana ff	Nana Ff	Nana ff	nana Ff	Na	F	NaxF	Na	F
Body weight,g	10	1107.8	076.4	1121.9	1143.3	-3.11	-5.85	-1.87	*	ns	ns	-3.58	+0.45
Body weight,g	15	1822.7	1841.7	1878.2	1860.2	-2.02	-0.99	+0.97	ns	ns	ns	-1.98	-0.03
Weight gain,g	0-10	1059.3	1027.9	1073.4	1095.2	-3.28	-6.14	-1.99	*	ns	ns	-3.75	+0.45
Weight gain,g	10-15	714.9	765.3	756.3	716.9	-0.28	+6.75	+5.50	ns	ns	ns	+0.48	-0.73
Growth rate,%	0-10	183.2	182.8	183.3	183.8	-0.33	-0.54	-0.27	ns	ns	ns	-0.27	0.00
Growth rate,%	10-15	48.8	52.5	50.4	47.7	+2.31	+10.1	+5.66	ns	ns	ns	+3.26	-0.99

Table 2: Summary of carcass traits of the first experiment as affected by naked neck and frizzle genes.

Trait	mean values of genes				Deviation from nana ff (% of nana ff)			Significance			Effect of the gene (%)	
	Nana Ff	Nana ff	nana Ff	nana ff	Nana Ff	Nana ff	nana Ff	Na	F	NaxF	Na	F
Feather, %	6.82	6.92	7.55	7.93	-14.0	-12.74	-4.79	**	ns	ns	-11.24	-3.23
Carcass,%	68.86	68.63	66.05	67.87	+1.46	+1.12	-2.68	**	ns	ns	+2.67	-1.16
Abdominal fat,%	1.30	1.30	1.49	1.45	-10.34	-10.34	+2.76	ns	ns	ns	-11.56	+1.45
Skin,%	4.95	4.64	5.37	5.09	-2.75	-8.84	+5.50	*	*	ns	-8.41	+6.06
Total fat#,%	6.25	5.94	6.86	6.54	-4.43	-9.17	+4.89	*	*	ns	-9.03	+5.13
Meat,%	32.89	32.09	30.28	32.03	+2.68	+0.19	-5.46	ns	ns	ns	+4.27	-1.47
Bone,%	16.30	16.79	15.33	16.24	+0.37	+3.39	-5.60	ns	ns	ns	+4.81	-4.23
Edible part,%	73.85	73.52	70.99	72.60	+1.72	+1.27	-2.22	**	ns	ns	+2.63	-0.88

Total fat = Abdominal fat plus skin.
** Significant at 1% level of probability
* Significant at 5% level of probability
ns Non-significant

Second experiment

The results tabulated in Tables 3 and 4 showed that there were highly statistically significant differences due to naked neck gene at both ages ($P \leq 0.01$) for body weight whereas it was higher in the naked neck birds (1230.2 & 1423.2 g) as compared with the normally feathered birds (1151.6 & 1361.8 g), respectively.

With respect to the weight gain between 0-10 weeks of age, the naked neck birds had significantly ($P \leq 0.01$) higher values than the normal birds by about 7.12%, but between 10-15 weeks of age there was no significant effect due to the naked neck gene. Moreover, the relative growth rate at both ages were insignificantly affected by the naked neck gene. The results are in partial harmony with those reported by (Bordas *et al.*, 1978; Cahaner *et al.*, 1993; Younis, 1996 and Saleh and Younis 1997), who found that growth performance was significantly improved by introducing the naked neck gene.

On the other hand, slow feathering gene effects were not statistically significant for growth performance. Ajang *et al.*, 1993 and Lowe and Merkley, 1986 found that the slow feathering gene in broiler could improve body weight. This disagreement may be due to the difference in the genetic background of the population in the present study (medium size layers) and those populations used by other authors.

Regarding carcass traits, there were highly significant differences attributed to naked neck gene for most carcass traits whereas the naked neck birds had significantly ($P \leq 0.01$) lower feather %, skin % and total fat% and higher meat yield % and bone % than those of the normal birds by about -20.2%. -8.74%, -8.65%, + 3.48% and +4.04%, respectively. While there were no significant differences between naked neck and normal birds for carcass %, abdominal fat% and edible part %. These results are in agreement with other studies in which whole body composition of naked neck chickens and their normal sibs were reported (Merat, 1986). These studies support that the meat production of chickens could improve by reducing plumage.

Regarding to the sex-linked K gene effects on carcass traits, there were no significant differences between slow and fast feathering birds for feather%, carcass%, abdominal fat% and edible part% while feather% in the slow feathering birds was lower as compared to the fast feathering ones by -4.84%. Moreover, the slow feathering birds had significantly ($P \leq 0.05$) lower skin%, total fat % and bone % and higher meat yield % by -6.77%, - 6.44%, - 3.74% and + 2.93% respectively. After three selection cycles, the slow line had lower feather and skin weight, and higher weight and breast meat than the fast line (Ajang *et al.*, 1993).

The interaction between the two genes (Na & K) had insignificant influence on growth performance and carcass traits. However, the naked neck slow feathering genotype (Nana Kk) showed generally the best performance compared with the other genotypes.

Table 3. Summary of growth performance of the second experiment as affected by naked neck and rate of feathering genes

Trait	Age (week)	Absolute or relative mean of genes				Deviation from nana kk (% of nana kk)			Significance			Effect of the gene (%)	
		Nana Kk	Nana kk	nana Kk	nana kk	Nana Kk	Nana kk	nana Kk	Na	K	Na xK	Na	K
Body weight,g	10	1236.0	1224.3	1160.8	1142.4	+8.19	+7.17	+1.61	***	ns	ns	+6.83	+1.27
Body weight,g	15	1442.1	1404.3	1359.6	1363.9	+5.73	+2.96	-0.32	**	ns	ns	+4.51	+1.21
Weight gain,g	0-10	1186.8	1175.4	1111.8	1093.3	+8.55	+7.51	+1.69	**	ns	ns	+7.12	+1.31
Weight gain,g	10-15	206.1	180.0	198.8	221.5	-6.95	-18.73	-10.25	ns	ns	ns	-8.16	+0.85
Growth rate,%	0-10	184.7	184.6	183.8	183.5	+0.65	+0.60	+0.16	ns	ns	ns	+0.52	+0.11
Growth rate,%	10-15	17.3	13.7	15.8	17.7	-2.26	-22.6	-10.7	ns	ns	ns	-7.74	+5.41

Table 4. Summary of carcass traits of the second experiment as affected by naked nack and rate of feathering genes

Trait	Relative mean of genes				Deviation from nana kk (% of nana kk)			Significance			Effect of the gene (%)	
	Nana Kk	Nana kk	nana Kk	nana kk	Nana Kk	Nana kk	nana Kk	Na	K	Na x K	Na	K
Feather,%	5.28	5.46	6.52	6.93	-23.8	-21.2	-5.92	**	ns	ns	-20.14	-4.76
Carcass,%	65.70	65.69	65.33	65.78	-0.12	-0.14	-0.68	ns	ns	ns	+0.21	-0.37
Abdominal fat,%	0.86	0.93	0.98	0.99	-13.1	-6.1	-1.0	ns	ns	ns	-9.60	-4.17
Skin,%	4.54	4.86	4.96	5.33	-14.8	-8.8	-6.9	**	*	ns	-8.74	-6.77
Total fat#,%	5.40	5.79	5.94	6.32	-14.6	-8.4	-6.01	**	*	ns	-8.65	-6.44
Meat,%	19.23	18.83	18.73	18.04	+6.6	+4.4	+3.8	**	*	ns	+3.48	+2.93
Bone,%	13.92	13.90	12.83	13.90	+14.4	0.0	-7.7	*	*	ns	+4.04	-3.74
Edible part,%	70.81	69.87	70.32	69.79	+1.46	+0.12	+0.76	ns	ns	ns	+0.40	+1.06

Total fat = Abdominal fat plus skin.
** Significant at 1% level of probability
* Significant at 5% level of probability
ns Non-significant

Third experiment

The results on average body weight, body weight gain and relative growth rate at different ages are summarised in Tables 5 and 6. The results showed that the naked neck gene did not significantly affect ($P > 0.05$) these traits whereas there were no statistically significant differences between naked neck and normal birds. The insignificant increase in body weight at both ages due to the naked neck gene observed in this experiment is not in agreement with previous reports (Bordas *et al.*, 1978; Cahaner *et al.*, 1993; Younis, 1996 and Saleh and Younis, 1997), who found that the naked neck birds had significantly heavier body weight compared with the normally feathered birds. Moreover, the effect of naked neck gene was pronounced in the heavy breeds (broiler chickens), which has been associated with losing the exess amounts of heat production than that in the medium chickens.

Table 5. Summary of growth performance of the third experiment as affected by three single genes (Na, K and F)

Genotype	Body weight, g		Weight gain, g		Growth rate, %	
	10wk	15wk	0-10wk	10-15wk	0-10wk	10-15wk
Nana Kk Ff	1103.0	1832.2	1055.1	729.2	183.3	49.7
Nana Kk ff	1097.1	1856.4	1049.1	759.3	199.9	51.4
Nana kk Ff	1132.5	1776.0	1083.1	643.5	183.3	44.2
Nana kk ff	1026.0	1890.0	978.8	864.0	182.4	44.1
nana Kk Ff	1137.9	1887.2	1088.8	749.3	199.8	49.5
nana Kk ff	1137.0	1891.9	1088.6	754.9	200.0	49.8
nana kk Ff	1110.0	1856.7	1061.7	746.7	183.3	50.3
nana kk ff	1123.8	1802.9	1076.3	679.1	183.7	46.4
	Deviation from nana kk ff (% of nana kk ff).					
Nana Kk Ff	-1.85	+1.63	-1.97	+7.38	-0.22	+7.11
Nana Kk ff	-2.38	+2.97	-2.53	+11.81	+8.82	+10.78
Nana kk Ff	+0.77	-1.49	+0.63	-5.24	-0.22	-4.74
Nana kk ff	-8.70	+4.83	-9.06	+27.23	-0.71	-4.74
nana Kk Ff	+1.25	+4.68	+1.16	+10.34	+8.76	+6.68
nana Kk ff	+1.17	+4.94	+1.42	+11.16	+8.87	+7.33
nana kk Ff	-1.23	+2.98	-1.36	+9.95	-0.22	+8.41
	Significances					
Na	ns	ns	ns	ns	ns	ns
K	ns	ns	ns	ns	ns	ns
F	ns	ns	ns	ns	ns	ns
Na × K	ns	ns	ns	ns	ns	ns
Na × F	ns	ns	ns	ns	ns	ns
K × F	ns	ns	ns	ns	ns	ns
Na × K × F	ns	ns	ns	ns	ns	ns
	Effect of the gene (%)					
Na	-3.33	-1.13	-1.76	+2.25	-2.33	-3.37
K	+1.89	+1.94	+1.95	+2.03	+6.88	+8.21
F	+2.28	-1.20	+2.29	-6.16	-2.14	+0.98

ns Non-significant

Table 6. Summary of carcass traits of relative to live body weight of the third experiment as affected by three single genes (Na, K, and F)

Genotype	Feather %	carcass %	Abd.fat %	Skin %	Total fat# %	Meat %	Bone %	Edible part%
Nana Kk Ff	6.05	67.64	1.11	4.31	5.42	31.75	16.53	71.85
Nana Kk ff	5.87	66.27	0.89	4.79	5.68	31.29	16.33	71.39
Nana kk Ff	6.26	67.56	1.01	4.80	5.81	31.25	16.61	71.95
Nana kk ff	5.74	66.04	1.27	4.64	5.91	31.24	16.38	70.98
nana Kk Ff	7.05	66.81	1.17	5.39	6.56	31.05	15.92	70.95
nana Kk ff	6.36	66.10	1.06	5.27	6.33	31.02	15.87	70.86
nana kk Ff	7.09	67.28	1.25	5.25	6.50	31.45	15.89	70.98
nana kk ff	7.21	65.77	1.04	5.36	6.40	30.99	15.98	70.81
Deviation from nana kk ff (% of nana kk ff).								
Nana Kk Ff	-16.09	+2.84	+6.73	-19.59	-15.31	+2.45	+3.44	+1.47
Nana Kk ff	-18.58	+0.76	-14.42	-10.63	-11.25	+0.97	+2.19	+0.82
Nana kk Ff	-13.18	+2.72	-2.88	-10.45	-9.22	+0.84	+3.94	+1.61
Nana kk ff	-20.39	+0.41	+22.12	-13.43	-7.66	+0.81	+2.50	+0.24
nana Kk Ff	-2.22	+1.58	+12.50	+0.56	+2.50	+0.19	-0.38	+0.20
nana Kk ff	-11.78	+0.50	+1.92	-1.68	-1.09	+0.10	-0.69	+0.07
nana kk Ff	-1.66	+1.51	+20.19	-2.05	+1.56	+1.48	-0.56	+0.24
Significances								
Na	*	ns	ns	*	*	ns	ns	ns
K	ns	ns	ns	ns	ns	ns	ns	ns
F	ns	*	**	ns	ns	ns	ns	*
NaxK	ns	ns	ns	ns	*	ns	ns	ns
NaxF	ns	ns	ns	ns	ns	ns	ns	ns
KxF	ns	ns	ns	ns	ns	ns	ns	ns
NaxKxF	ns	ns	ns	ns	*	ns	ns	ns
Effect of the gene (%)								
Na	-13.71	+0.59	-5.31	-12.78	-11.47	+0.80	+3.39	+0.90
K	-3.80	+0.08	-7.02	-1.40	-2.76	+0.16	-0.37	+0.11
F	+4.92	+1.92	+6.57	-1.59	-0.16	+0.77	+0.62	+0.59

Total fat = Abdominal fat plus skin. * Significant at 5% level of propability
** Significant at 1% level of pobability ns Non-significant

The effect of both rate of feathering gene and frizzle gene on growth performance was not observed whereas there were no significant differences among genotypes. However, the slow feathering birds had better body weight (1866.9 g) than the fast feathering ones (1831.4 g) by about 1.94%. These results are in fair agreement with those of Ajang *et al.* (1993) and Lowe and Merkley (1986), who reported that the introducing slow feathering gene (K) to broiler chickens could improve body weight.

The proportions of feather, skin and total fat were significantly ($P \leq 0.05$) influenced by naked neck gene whereas feather %, skin % and total fat % of naked neck birds were 13.71%, 12.78% and 11.47% (in their respective order) less than the normally feathered birds.

These obesrvations were of the same magnitude as those shown by Monnet *et al.* (1979); Hanzel and Somes (1983); Zein El- Dein *et al.* (1984); El-Attar and Merat, 1985; Merat, 1986 and 1990; Cahaner *et al.*, 1993; Younis

(1996) and Saleh and Younis (1997), who found that feather mass either absolute or relative to live body weight and fat deposition of naked neck birds were significantly lower than those of normal birds.

On the other hand, there were insignificant differences between naked neck and normal birds of carcass %, meat yield%, bone% and edible part% but the naked neck birds exhibited percentager for these traits. Cahaner, *et al.*, (1993) found that the naked neck allele increase breast meat about 16.7% and 11.3% at high and normal temperatures, respectively for the broiler chickens.

Significant effects of rate of feathering gene on carcass traits were not observed, whereas there were no significant differences between slow and fast feathering birds. However, there were significant differences ($P \leq 0.05$ & $P \leq 0.01$) between frizzle and normal birds for carcass %, abdominal fat % and edible part % through which the frizzle birds showed higher carcass %, edible part % and abdominal fat % by about 1.92%, 0.59% and 6.57% respectively.

The interaction effects of the Na, K and F genes on growth performance and carcass traits were generally not significant except the interaction between Na × K and Na × K × F for total fat ($P \leq 0.05$) whereas the two genotypes Nana Kk Ff and Nana Kk ff showed less total fat than the other genotypes.

It could be generally concluded that most the advantages of introducing the single genes Na, K and F to the males of medium-type layers were concerning mainly with some carcass traits especially reducing the total fat content rather than growth traits. Furthermore, the combination of Na, K and F or at least Na and K is recomended to be introduced to males of layers of brown egg type in order to improve the carcass quality of these males, which help in exploiting them for meat production.

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دراسات وراثية لتحسين الاداء الانتاجى لهجن إنتاج البيض بواسطة الجينات المفرده
١- إنتاج اللحم من تراكيب وراثية مختلفة للذكور

حسن يونس – طلعت محمد السيد – كمال صالح

قسم إنتاج الدواجن – كلية الزراعة بكفرالشيخ – جامعة طنطا – مصر

أجريت ثلاث تجارب لاختبار الاداء الانتاجى لذكور من هجن تجارية بنيه اللون لانتاج البيض (دالم الاحمر) تحتوى هذه الذكور على تراكيب وراثية مختلفة من الجينات المفردة وهى جينات عرى الرقبه (Na)، الريش المجعد (F) ومعدل التريش (K).

تم أخذ الذكور من عمر يوم وربيت فى مجموعات حسب التراكيب الوراثية لكل تجربة حتى عمر ١٥ أسبوع ، عندها تم ذبح عدد ١٥ ذكر لكل تركيب وراثى لدراسة خواص الذبيحه عليهم. يتضح من النتائج ان وزن الجسم عند ١٥ أسبوع كان أثقل فى الطيور العارية الرقبة عند مقارنتها بالطيور الطبيعية وذلك فى التجربة الثانية بينما فى التجربة الأولى والثالثة لم تظهر فروق.

كذلك وجد أن جين عرى الرقبة كان تاثيرة اكثر وضوحا على صفات الذبيحه من خلال انه ينقص نسب الريش، الجلد، الدهن الكلى (الجلد + دهن البطن) ويزيد من نسب محصول اللحم والجزء المأكول.

من ناحيه اخرى، لم يظهر تأثير جين الريش المجعد على اداء النمو بينما كان واضح التأثير على نسب الجلد والدهن الكلى فى التجربة الاولى والثالثة حيث كانت الطيور المجعده الريش اكثر ترسيبا للدهن عندما قورنت مع الطيور الطبيعية.

علاوه على ذلك، وجدا ان جين بطىء التريش ادى الى تحسن نسب الجزء المأكول ومحصول اللحم وادى الى نقص نسب الجلد والدهن الكلى.

ولم يظهر تاثير للتفاعل بين الجينات المختلفة على اداء النمو او صفات الذبيحه فيما عدا التفاعل بين جينى عرى الرقبه ومعدل التريش والتفاعل بين الجينات الثلاثة بالنسبة للدهن الكلى حيث كان التفاعل معنويا.

وعموما تشير النتائج أن إدخال الجينات الثلاثة المشار اليها (عرى الرقبة – الريش المجعد – معدل التريش) أو على الاقل الاثنان منهما فى التركيب الوراثى لذكور هجن البيض يتوقع معه تحسين فى خواص الذبيحه على الاقل بما يساعد على استغلال تلك الذكور فى إنتاج اللحم.