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Carcass parameters of the cross between Pekin duck drakes with Sudani (Egyptian Muscovy) duck females

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Abstract

Sudani *(Cairina moschata)* duck one of the popular birds in Egypt, because, Sudani ducks have higher carcass quality and immune response. On the other hand, Pekin *(Anas platyrhynchos)* ducks grow rapidly and the high percentage of fat in the carcass, which reduces the appetite to buy in Egypt compared to Sudani duck. The objectives of the study aimed to improve the carcass quality for Pekin duck by crossing with Sudani ducks. This experiment was carried out at private farm in Egypt (Fayoum governorate). At 32 wks of age, the 8 Pekin males (P) allowed to natural mating with 32 Sudani (S) female (each male was mated with 4 females). When the ducklings attained marketing age at 8, 14 and 9 wks for Pekin, Sudani ducks and their cross (PS) respectively, 16 birds from each strain, in addition to their cross were randomly taken and slaughtered for carcass evaluation. The non-edible meat parts (blood -feathers – head- leg), edible meat parts (dressed carcass – gizzard-liver - heart), abdominal fat, gizzard fat, skin, wings, neck ,thigh, drumstick and breast muscles (minor and major) were determined. The results revealed that the Pekin duck had significantly (P≥0.0001) higher relative giblets compared to Sudani or PS cross. The PS cross had significantly (P<0.05) higher relative edible meat parts weight compared to their parents. The Sudani and PS cross had significantly (P≤0.0001) higher relative breast muscles compared to Pekin one. The Pekin duck had significantly (P≤0.0001) higher relative skin compared to Sudani or PS cross. No significant differences among PS cross and their parents for relative gizzard fat and abdominal fat weight. The PS cross recorded negative heterosis for gizzard, liver, giblets, thigh, drumstick, gizzard fat, abdominal fat, skin and neck. The PS cross recorded positive heterosis for live body weight, dressed carcass, heart, edible meat parts. major, minor, breast muscles and wings. Finally, The PS cross had higher breast muscle content and much lower fatness compared to Pekin ducks.

Keywords: Carcass parameters, Egyptian Muscovy, Sudani, Pekin duck, Cross, Heterosis.

Introduction

Ducks were known in ancient China and Egypt and used to produce meat and eggs as well as feathers and downs (Pingel 1999 & Makram, 2015 and Makram *et al.,* 2017a). Cross breeding Pekin and Muscovy breeds has been used as a tool to modify carcass composition. Crossing of these two duck breeds produced an infertile mule duck (Abdel-Samie and Farrell, 1986) with improved carcass yield and quality (Vernam, 1998).Sudani breeds is considered a local breed and more favorable to the Egyptian consumer and more heat tolerant as compared to Muscovy duck as a foreign breed. (El-Soukkary *et al.,* 2005; Galal *et al.,* 2011). The carcass of this hybrid had 17.0% skin plus fat and 14.6% muscle compared to pure Pekin which had a 26.6% skin plus fat and 12.9% muscle (Abdel- Samie and Farrell, 1986). Dressing percentage was occurred generally high and ranged from 67.9 (PP54 males) to 70.3% (Star 63 females). However, lower dressing percentage (64.9-67.3%) were reported for paternal duck strains were reported by (Mazanowski and Książkiewicz, 2004 & Adamski *et al*., 2005) while in those from maternal strains by (Mazanowski and Bernacki (2004) in Peking ducks it ranged between 61.51 to 62.5 %. Mule ducks record higher liver weights than Muscovy ducks since their ingestion capacity was also higher (Guy *et al.,* 1995). Wawro *et al* (2004) reported that positive heterosis (He) in carcasses of the Mullard drakes was noted firs of all in the traits connected with undesirable fatness: Hetrosis ♂ was equal to -92.4% for abdominal fat weight, -42.9% for the weight of skin with subcutaneous fat, and -32.0 % for the percentage of skin with subcutaneous fat in a carcass. Positive

hetrosis was also observed in the percentages of breast muscles (He = 12.8%) and total meat (He >21%) in a carcass. This work was designed to evaluate carcass parameters among Pekin, Sudani and their cross.

Materials and Methods

This study was carried out at private farm in Fayoum Governorate. At 32 wk of age, the seven Pekin males (P) were allowed to naturally mating with 28 Sudani (S) female (each male was mated with four females). The total number of offspring produced from this mating were 74 ducklings. They were fed A diet containing 22 % protein and 2900K/cal was fed to Pekin strain (0-2 wk) while Sudani and the cross (0-4 wk). A diet containing 16% protein and 3000 K/cal was fed to Pekin strain from 2 - 8 wk, while a diet containing 20 % protein and 2900 K/cal was fed to Sudani and PS cross from to 4 wk to the marketing age. Marketing age, (8, 14 and 9 wks) for Pekin, Sudani and their cross (PS) respectively.

Carcass measurements: When the ducklings attained marketing age, 16 birds from each strain, in addition their cross were randomly taken and slaughtered for carcass evaluation. They were slaughtered after weighing. Then they were reweighed after bleeding to calculate blood weight by difference. Feathers were manually plucked up after scalding at hot water, and then the birds were reweighed to calculate feathers weight by difference. Head, shank and foot were weighed after removing. The giblets (gizzard, liver and heart) were dissected from the viscera. The abdominal fat, gizzard fat and skin was removing and weighing. The wings and neck were removed and weighing. The carcass, thigh, drumstick and breast muscles (minor and major) were weighed. All parts were expressed as percentages of the live body weight.

The crossbreed effect or heterosis (Hybrid vigor) was calculated by the following formula:

$$\text{Heterosis \%} = \frac{\text{Mean cross breed (XC)} - \text{Mean pure breed (XP)}}{\text{Mean pure breed (XP)}} \times 100$$

Statistical analysis: Data were subjected to using one-way Analysis of variance with the strain effect using General Linear Model (GLM) procedure of **SAS (2001)**. According to the following model (I); $\mathbf{Y_{ij} = \mu + S_i + e_{ij}}$

Where; Y_{ij}= Trait measured, μ = Overall means, S_i = Strain effect, e_{ij} = Experimental error

Results and Discussion

Edible and non-edible meat parts: Relative edible and non-edible meat parts weight of PS cross and their parents is summarized in Table (1). The PS cross had significantly higher relative dressed carcass weight compared to Sudani or Peking one. With respect to relative giblets weight, Peking duck was significantly higher giblets weight (6.15%) compared to Sudani (5.59%) and PS cross (5.19%). Finally, The PS cross had significantly higher relative edible meat parts weight compared to Sudani or Peking one. However, the Pekin duck had significantly higher relative non-edible meat parts compared to PS cross; however, Sudani duck was intermediate. A growing interest in crossbreeds of Muscovy drakes with Pekin ducks could be observed in the last years of the previous century (Baeza *et al.,* 2000; Mazanowski and Bernacki, 2000; Wawro *et al*., 2001 and Makram *et al.,* 2015). Such hybrids, called Mullards, were used in the past mainly for fattened liver production, nowadays they are also used for broiler production. Heo *et al.* (2015), postulated that no significant difference for relative and absolute wing, neck, leg and breast for the crosses between line A and B (lines from korena native duck) at 8 weeks of age. Makram *et al*. 2017b) found that no significant difference between Muscovy, Sudani ducks and their cross.

Relative breast, thigh and drumstick weight: Relative breast, thigh and drumstick muscles weight of PS cross and their parents is summarized in Table (2). Data information presented the superiority of relative thigh weight for Pekin than either Sudani or PS cross. Opposite trend was noticed for breast muscles. Pekin ducks are characterized by a high growth rate and a considerable meat content of a carcass (Ksiazkiewicz, 1995; Lewczuk *et al.,* 1992). Their commonly known defects are excessive fatness and a low percentage of breast muscles in a carcass (Szasz and Bogenfurst, 1998).The cross between Muscovy and Sudani was significantly higher for thigh muscles compared to their parents (Makram *et al.,* 2017b). Relative gizzard fat, abdominal fat, skin, neck and wings weight of PS cross and their parents are summarized in Table (3). Peking duck had significantly higher relative skin weight compared to Sudani or PS cross one. Similar trend was noticed to relative neck weight when compared to Sudani one, however, the PS cross was intermediate. With respect to relative wings weight, the Peking duck had the significantly lowest compared to Sudani or PS cross. Ducks are characterized by the genetic Predisposition to fat. The consumers usually prefer food with a low fat content. Abdominal fat weight could be used as a criteria for prediction of total body fat content of poultry (Arslan *et al.,* 2003). Pingel (1999) confirmed that the breast muscle decreased and the skin increased in Muscovy, Pekin and Mulard before marketing age.

Table (1): Means ± SE of relative edible and non-edible parts weight parental duck strains and PS cross at marketing age.

Traits %	Breed Group (BG)		PS*	Level of significant
	Peking (P)	Sudani (S)		
Edible parts				
Dressed carcass	68^{b}±0.53	68^{b}±0.73	71^{a}±0.25	**0.0007**
Gizzard	2.80^{a}±0.06	2.85^{a}±0.10	2.42^{b}±0.10	**0.02**
Liver	2.64^{a}±0.09	1.94^{b}±0.05	1.94^{b}±0.12	**0.0001**
Heart	0.708^{b}±0.03	0.798^{ab}±0.03	0.824^{a}±0.04	**0.03**
Giblets	6.15^{a}±0.11	5.59^{b}±0.14	5.19^{b}±0.18	**0.0003**
Edible meat parts	73.90^{b}±0.51	73.75^{b}±0.65	76.40^{a}±0.16	**0.02**
Non edible t parts				
Blood	4.304±0.56	3.862±0.32	2.83±0.56	**NS**
Feather	7.839±0.63	7.304±0.28	7.25±0.53	**NS**
Head	3.96^{b}±0.05	3.91^{b} ±0.09	4.29^{a}±0.19	**0.05**
Leg	2.18^{b}±0.04	2.88^{a}±0.08	2.27^{b}±0.03	**0.0001**
Non edible meat parts	18.27^{a}±0.57	17.96^{ab}±0.32	16.64^{b}±0.42	**0.05**

$^{a \text{ and } b}$ Means within the same row with different letters are significantly differed

PS= the cross between Pekin males with Sudani females.

Table (2): Means ± SE of relative breast, thigh and drumstick muscles weight parental duck strains and PS cross at marketing age.

Traits %	Breed Group		PS*	Level of significant
	Peking (P)	Sudani (S)		
Major	7.66^{b}±0.32	11.90 ±0.51	11.43^{a} ±0.56	**0.0001**
Minor	1.17^{b} 0.03	1.73^{a} ±0.07	1.65^{a} ±0.16	**0.0001**
Breast	8.94 ±0.33	13.62^{a}±0.22	13.08^{a}±0.72	**0.0001**
Thigh	7.61 ±0.37	4.47^{b}±0.24	5.01^{b}±0.60	**0.0001**
Drumstick	8.31±0.39	7.63±0.56	7.79±0.49	**NS**

$^{a \text{ and } b}$ Means within the same row with different letters are significantly differed

PS= the cross between Pekin males with Sudani females.

Table (3): Means ± SE of relative abdominal, Gizzard fat, neck and wings weight of parental duck strains and PS cross at marketing age.

Traits %	Breed Group		PS*	Level of significant
	Peking (P)	Sudani (S)		
Gizzard fat	0.163±0.04	0.194±0.07	0.159 ±0.03	**NS**
Abdominal fat	1.331±0.08	1.117±0.16	0.936±0.18	**NS**
Skin	11.645^{a}±0.43	7.89^{b}±0.55	8.946^{b}±0.81	**0.0001**
Neck	5.01^{a}±0.08	4.05^{b}±0.17	4.535^{ab}±0.33	**0.0001**
Wings	7.506^{b}±0.29	10.21^{a}±0.34	10.517^{a}±0.47	**0.0004**

$^{a \text{ and } b}$ Means within the same row with different letters are significantly differed,

NS = Non significant, ***PS=*** the cross between Pekin males with Sudani females.

Hetrosis: Results presented in Table (4) showed negative heterosis for gizzard, liver and giblets (-13.97, -15.21 and -11.86% respectively), however, there was positive heterosis for live body weight, dressed, heart, giblets and edible meat parts (6.98, 4.96, 8.19, 15.17 and 2.67%, respectively). The PS cross recorded positive heterosis for major, minor, breast muscles and wings, however, there was negative heterosis foe thigh, drumstick, gizzard fat, abdominal fat, skin and neck. Wawro *et al* (2004) postulated that positive heterosis in carcasses of the Mullard drakes was noted firs of all in the traits connected with undesirable fatness: Hetrosis ♂ was equal to -92.4% for abdominal fat weight, -42.9% for the weight of skin with subcutaneous fat, and -32.0 % for the percentage of skin with subcutaneous fat in a carcass. Positive heterosis was also observed in the percentages of breast muscles (He = 12.8%) and total meat (He >21%) in a carcass. The cross between Muscovy Sudani recorded negative hetrosis for edible meat parts, breast muscles, skin, neck wings (Makram *et al.,* 2016 and 2017b) however they found that the same cross recorded positive hetrosis for giblets, thigh, drumstick, abdominal fat.

Table (4): Effect of heterosis (%) on carcass traits of PS cross.

Trait	Hetrosis	Trait	Hetrosis
Live body weight	6.98	**Minor pectoral muscle**	15.92
Dressed	4.96	**Breast Muscles**	15.15
Gizzard	-13.97	**Thigh**	-7.17
Liver	-15.21	**Drumstick**	-2.42
Heart	8.19	**Gizzard fat**	-12.72
Giblets	-11.86	**Abdominal fat**	-19.12
Edible meat parts	2.67	**Skin**	-5.25
Major pectoral muscle	15.23	**Neck**	-1.97
		Wings	14.45

References

Abdel-Samie, R. E., & J. D. Farrell, 1986. Carcass composition and carcass characteristics of ducks. Pages 83-101 in: Duck Production Science and World Practice (Farrell and Stapleton, Eds.).University of New England, Amidale, Australia.

Adamski, M., Z. Bernacki & J. Kuzniacka 2005.The effects of origin and sex on rearing results of ducks from two ancestral paternal strains. Acta Scientiarum Polonorum, Zootechnica 4(1), 13-28

Arslan, C., M. Çitil & M. Saatci 2003. Effects of L-carnitine administration on growth performance, carcass traits, blood serum parameters and abdominal fatty acid composition of ducks, Archives of Animal Nutrition, 57:5, 381-388.

Baeza, E., M. R. Salichon, G. Marche, N. Wacrenier, B. Dominguez& J. Culioli 2000. Effect of age and sex on the structural, chemical, technological characteristics of mule duck meat. Brit Poultry Sci., 41: 300-307.

El-Soukkary, F. A., H. M. Mohamed, A. A. Dawood & S. Y. Abd-El Sayed 2005. Physico-chemical, microbiological and lipid characteristics of duck meat. Minufiya J. Agric. Res., 30: 527-548.

Galal, A., W.A.H. Ali, A.M.H. Ahmed, & A.A. Ali 2011. Performance and carcass characteristics of Domyati, Muscovy, Peking and Sudani duck breed. Egypt. J. Anim. 48(2):191-202.

Guy, G., D. R. Pailley & D. Gourichon 1995. Comparison of geese, mule duck and Muscovy duck after cramming. Annales-de-Zootechnie. 44: 297-305.

Heo, K. N., E. C. Hong, C. D. Kim, H. K. Kim, M. J. Lee, H. J. Choo, H. C. Choi, M. M. H. Mushtaq, R. Parvin & J. H. Kim 2015. Growth Performance, Carcass Yield, and Quality and Chemical Traits of Meat from Commercial Korean Native Ducks with 2-Way Crossbreeding. Asian Australas. J. Anim. Sci. 3: 382-390.

Ksiazkiewicz, J. M 1995. Duck breeding strategy. In: 11th Proc. Inter. Symp. "Current Problems in Avian Genetics", Balice, 111-119.

Lewczuk, A., R. Bochino & E. Wawro 1992. Slaughter value of Muscovy and Pekin of A-44 strain ducks. Prace Materiały Zoot. 42: 83-90.

Makram, A. (2015). Improving the productive performance of native duck breed by crossing with standard commercial duck breed. PhD, thesis. Faculty of Agriculture, Ain Shams Univ, Egypt.

Makram. A., A. Galal, & A. H. EL-Attar 2016. Carcass parameters comparison between two crosses

from Sudani duck (Egyptian Muscovy).The 9th International Poultry Conference from 7-10 November.233-243.

Makram. A., A. Galal and A. H. EL-Attar .2017a. Effects of Strain and Sex on Carcass Parameters for Three Duck Strains. The 7th International Conference for Sustainable Agriculture Development from 6-8 March, 248-256.

Makram. A., A. Galal and A. H. EL-Attar .2017b. Carcass parameters of Sudani, Muscovy duck strains and their cross. Egyptian J. Anim. Prod. 54(1):47-53.

Mazanowski, A. & Z. Bernacki 2000. Rearing and fattening performance of variously fed crossbreds of Muscovy drakes and Pekin- type ducks. Ann. Anim. Sci., Rocz. Nauk. Zoot. 27: 181-199

Mazanowski, A. & Z. Bernacki 2004. Comparison of meat traits, carcass slaughter value and chemical composition of duck meat from three maternal strains. Annals of Anim. Sci, 31: 39-54.

Mazanowski, A. & J. Ksiazkiewicz 2004. Comprehensive evaluation of meat traits of ducks from two sire strains. Journal of Animal and Feed Sciences 13, 173-182.

Pingel, H. 1999. Influence of breeding and management on the efficiency of duck production, lohman information No. 22, page 7.

SAS Institute 2001. SAS/STAT User's Guide Version 8.2 ed: Statistics. SAS Institute Inc., Cary, NC.

Szasz, S. & F. Bogenfurst 1998. Study on body fat content in Pekin, Muscovy and mule ducks. Proc. 10th Europ. Poultry Conf., 2: 719-722.

Vernam, J. P. 1998. The relationships of wests in Pekin duck production. World Poultry i4 (lO): M-35.

Wawro, K, K., E. Wilkiewicz- Wawro, K. K. Kleczek & W. Brzozowski 2004.Slaughter value and meat quality of Muscovy and Pekin ducks and their crossbreds and evaluation of hetrosis Effects. Arch .Tierz.3: 287–299.

Wawro, K., R. Bochno, & E. Wilkiewicz-Wawro 2001. Slaughter value of crossbred ducks (Muscovy × Pekin) slaughtered at a different age. Natur. Sc., 8, 17-25.