

Estimation and analyzing sexual dimorphism for body weight and carcass traits of white and brown Domyati ducks

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ABSTRACT

The difference in body weight between males and females, hereafter called sexual dimorphism, the present study aimed to study the difference between white and brown Domyati duck for sexual dimorphism. At marketing age (8 wks) 16 (8 male + 8 female) brown and 14 white (7 male + 7 female) Domyati ducks, were used to estimate the body weight and carcass traits as non-edible meat parts (blood- feather- head- legs – viscera), edible meat parts (dressed carcass- liver- gizzard- heart), muscles (major – minor- breast muscles – thigh – drumstick), abdominal fat, gizzard fat, skin, wings, skeleton, and neck. Our results showed that the white Domyati ducks were significantly higher for sexual dimorphism for all traits compared to brown Domyati ducks. There was a significantly high positive correlation between body weight and abdominal fat, major, minor, breast muscles, thigh, and drumstick in male and female brown Domyati ducks. The same trend was noticed for white male and female Domyati ducks. However, the spleen had a lower positive correlation with body weight on both sexes of brown Domyati ducks, while, the spleen recorded a higher positive correlation with body weight of both sexes of white Domyati duck strain. In conclusion, there was a significant difference between white and brown Domyati ducks for some traits.

Keywords: Feather color, Indoor, Outdoor system, Carcass traits, Marketing age, Pearson correlation, Linear regression, Mallard duck, Domyati duck.

Introduction

Ducks are the second most desirable bird for consumers in Egypt. Egypt is one of the countries that produce the higher ducks production in Africa and the world, with annual duck production ranging from 100-150 million ducks annually (FAOSTAT, 2019). The types of ducks raised in Egypt limit both types Muscovy (*Cairina moschata*) and the second from Mallard ducks (*Anas platyrhyncho*). Muscovy types stains like French Muscovy (commercial), Sudani and Fayomi ducks (local strains), however, the Mallard types like Pekin (Commercial strain), Khaki Campbell (Exotic breed), Domyati and Shershery ducks (local strains) (Galal et al., 2011:

Makram 2015 and 2016: Makram et al., 2021a). The difference in body weight between males and females, hereafter called sexual dimorphism is particularly marked in poultry. For example, Muscovy male ducks are 40 % heavier than females at slaughtering age, (Mignon-Grasteau et al., 1998). These sex-associated differences have been reported in previous studies on Muscovy ducks (Baeza et al., 2001; Tegua et al., 2008; Yakubu et al., 2009a, b). The dimorphism might be attributed to the usual association between sex hormones and growth as reported by Deeb and Cahaner (2001). Multiple regression analysis has been used to interpret the complex relationship between body weight and

some body measurements in several animals (Cankaya et al., 2006; Akar et al., 2001). Raji, et al (2010) reported that the best model for each dependent variable was determined based on high adjusted R². Breast muscle weight can be predicted in males with the use of chest girth and live weight and in females using live weight, chest width, and breast bone crest length. Thigh weight was predicted based on live weight, chest width, and chest girth in males while for females the independent variables were chest girth, chest width, live weight, and chest depth. This experiment was designed to compare both white and brown Domyati ducks for sexual dimorphism for body weight and carcass parameters.

Materials and Methods

168 Domyati ducklings were hatched, healthy, and with high vitality. They were reared under the same environmental, managerial, and hygienic conditions from one day old to the end of the experiment. As for the lighting systems, it was 24 hours throughout the experiment period (8 weeks). All ducklings were brooded in floor pens. The brooding temperature was 33 Co for the first three days and then reduced gradually until it reached 26 Co at two weeks of age. Feed and water were provided ad libitum., at first weeks of age they were divided into two groups according to feather color, white feather (WF) and brown feather (BF) (Photo1). Their distribution ratios were 9% and 91% for WF and BF, respectively. The feed and water were supplied ad libitum. They were fed a diet containing 23 % protein and 3000 K/Cal (0-3 wk), 21% P and 3100 K/Cal (3 – 5 wk) and 18 % P and 3200 K/Cal (5-8wk).

Treatments: At 8 weeks of age 16 (8 male+ 8 female) and 14 (7 male+ 7 female), birds of brown and white feathers respectively were used for carcass parameters as follows:

Non-edible meat parts: blood – feather – head – legs – viscera.

Edible meat parts: Dressed carcass- liver- gizzard – heart

Muscles: Breast Muscles (major- minor) – thigh – drumstick

Fat: Skin – abdominal fat – gizzard fat
Neck and wings.

Sexual dimorphism: Sexual dimorphism was calculated for live body weight and body measurements at marketing age, sexual dimorphism was calculated according to Smith, (1999) using the following equations:

Sexual dimorphism = ((Male weight/ female weight) - 1) X 100

Statistical analyses: Data are concerned with sexual dimorphism for carcass traits, using the General Linear Model (GLM) procedure of SAS (2003). According to the following model (I);

$$Y_{ij} = \mu + F_i + e_{ij}$$

Where;

Y_{ij} = Trait measured,

μ = Overall means,

F = Feather color effect

e_{ij} = Experimental error.

Regression analysis: Simple regression analysis was used to explore the relationship between variables. The general expression of a simple regression model formed for the measurements, one dependent and independent variable is given as

$$Y = b_0 + b_1 X_1$$

Where;

Carcass traits = the dependent variable or response

X independent variables or predictors (live body weight).

Results and Discussion

Sexual dimorphism: non-edible, edible meat parts, muscles, and fats are presented in Tables (1, 2, 3, and 4). There significant difference between white and brown Domyati ducks for sexual dimorphism, with the white Domyati ducks was significantly higher for sexual dimorphism for most carcass traits, non-edible meat parts 9.5%, 35.6%, edible meat parts 10. 20.2%, thigh 4.6, 32.4% drumstick 10.9, 47.8%, abdominal fat 19.9, and 80.2% for brown and white Domyati duck respectively. The opposite trend was noticed for gizzard fat, in which the brown Domyati duck was significantly higher (19.2%) for gizzard fat compared to white Domyati ducks (-37.4%). Yakout and Kosba (2009) performed a comparison of domestic ducks in different governorates of Egypt for shank length in both sexes. However, males and females were 6.5 and 6.2 cm in the Gharbia governorate, 7.4 and 7.3 cm in the Fayoum governorate, and 5.9 and 5.2 cm in the Sohag governorate. Rayan et al (2020) postulated that sexual dimorphism of body weight and carcass traits of Pekin duck was significantly affected by different raising protocols. The group that was reared indoors and fed the commercial diet with grass (G2) had significantly lower sexual dimorphism for live body weight, dressed carcass, giblets, and edible meat parts compared to the other experimental two groups indoor and outdoor. Makram et al., (2021b) confirmed that the sexual dimorphism for non-edible parts in Sudani ducks (84.46%) was significantly higher compared to Pekin (8.14 %) or the Muscovy ducks (67.38 %), the same

trend was noticed for edible meat parts. Also, they found that the sexual dimorphism for breast muscles, thigh, and drumstick, in Pekin ducks were significantly lowest compared to Sudani and

Muscovy ducks, they found that the Pekin ducks exhibited higher dimorphism for abdominal fat compared to Sudani and Muscovy ducks.

Table (1): Sexual dimorphism of body weight and non-edible meat parts of Domyati ducks

Traits (gm)	Brown		White		
	Sex		Sex		
	Male	Female	Male	Female	
BW	2263.7 ±113.72	2026 ±120.92	2405 ±114.07	2091 ±117.49	
Blood	112.0 ±5.01	105.9 ±2.33	126.0 ±5.11	107 ±3.73	
Feather	140.2 ±76.71	126.1 ±98.07	151.0 ±98.34	129 ±102.17	
Leg	62.1 ±6.86	55.4 ±4.35	66.54 ±4.43	55.5 ±6.70	
Head	99.2 ±4.36	88.6 ±5.74	101.3 ±4.44	125.6 ±4.72	
Viscera	153.0 ±0.90	125.6 ±1.17	164.2 ±0.75	143.3 ±1.67	
Non-edible	566.1 ±10.02	501.6 ±7.43	610.7 ±0.51	523.6 ±9.70	
Sexual dimorphism (%)				Level of Significant	
Traits (%)	Brown		White		Sig.
BW	10.12 ^b ±0.64		20.90 ^a ±5.88		0.002
Blood	3.58 ^b ±1.53		30.99 ^a ±12.71		0.0005
Feather	8.34 ^b ±0.93		28.88 ^a ±12.10		0.002
Leg	9.96 ^b ±0.63		28.12 ^a ±8.11		0.0002
Head	10.49 ^b ±0.52		20.41 ^a ±6.29		0.005
Viscera	0.37±7.29		-38.88±53.42		N.S
Non-edible	9.53 ^b ±1.77		35.58 ^a ±19.00		0.015

^a and ^b Means within the same row with different letters significantly differ.

Table (2): Sexual dimorphism of edible meat parts of Domyati ducks

Traits (g)	Brown		White		
	Sex		Sex		
	Male	Female	Male	Female	
Dressed	1566.7 ±113.72	1407.3 ±120.92	1650 ±114.07	1456 ±117.49	
Liver	54.7 ±5.01	46.7 ±2.33	62.4 ±5.11	44.6 ±3.73	
Gizzard	65.0 ±76.71	57.9 ±98.07	62.8 ±98.34	57.02 ±102.17	
Heart	15.8 ±6.86	15.0 ±4.35	15.0 ±4.43	15.3 ±6.70	
Giblets	132.9 ±4.36	117.4 ±5.74	135.0 ±4.44	111.4 ±4.72	
Edible meat	1698.3 ±0.90	1524.7 ±1.17	1790.8 ±0.75	1567.4 ±1.67	
Sexual dimorphism (%)				Level of Significant	
Traits (%)	Brown		White		Sig.
Dressed	10 ^b ±0.90		19.70 ^a ±6.30		0.01
Liver	13.41 ^b ±1.22		60 ^a ±18.79		.0001
Gizzard	10.08±1.63		20.33±9.96		N.S
Heart	2.59 ^b ±1.43		21.68 ^a ±8.63		0.0009
Giblets	10.74 ^b ±0.82		32.92 ^a ±11.04		0.0006
Edible meat	10.05 ^b ±0.69		20.29 ^a ±5.99		0.004

^a and ^b Means within the same row with different letters significantly differ.

Table (3): Sexual dimorphism of body weight and carcass traits of Domyati ducks

Traits (g)	Brown		White		
	Sex		Sex		
	Male	Female	Male	Female	
Thigh	157.5 ±113.72	145.0 ±120.92	153.2 ±114.07	131.0 ±117.49	
Drum	216.5 ±5.01	190.2 ±2.33	234.1 ±5.11	204.0 ±3.73	
Major	187.8 ±76.71	174.6 ±98.07	208.6 ±98.34	192.2 ±102.17	
Minor	24.9 ±6.86	23.4 ±4.35	25.1 ±4.43	25.0 ±6.70	
Breast Muscles	212.8 ±4.36	198.0 ±5.74	233.7 ±4.44	217.2 ±4.72	
Sexual dimorphism (%)				Level of Significant	
Traits (%)	Brown		White		Sig.
Thigh	4.62 ^b ±1.69		32.40 ^a ±17.02		0.004
Drum	10.86 ^b ±1.61		49.73 ^a ±34.36		0.03
Major	4.47 ^b ±1.34		23.50 ^a ±14.65		0.02
Minor	2.26±2.27		18.56 ^a ±19.08		0.02
Breast Muscles	7.47		7.60		

^a and ^b Means within the same row with different letters significantly differ.

Table (4): Sexual dimorphism of some carcass traits of Domyati ducks

Traits (g)	Brown		White		
	Sex		Sex		
	Male	Female	Male	Female	
Gizzard fat	4.1 ±113.72	3.3 ±113.72	2.3 ±114.07	4.4 ±114.07	
Abdominal fat	22.18 ±5.01	17.70 ±5.01	17.8 ±5.11	18.43 ±5.11	
Wings	198.0 ±76.71	187.0 ±76.71	197.0 ±98.34	182.0 ±98.34	
Neck	111.0 ±6.86	98.4 ±6.86	118.0 ±4.43	103.2 ±4.43	
Skin	190.2 ±4.36	160.3 ±4.36	203.3 ±4.44	177.3 ±4.44	
Skeleton	234.0 ±4.36	207.8 ±4.36	246.0 ±4.44	225.5 ±4.44	
Bursa	1.87 ±4.36	2.60 ±4.36	1.68 ±4.44	2.20 ±4.44	
Spleen	1.46 ±4.36	5.49 ±4.36	1.32 ±4.44	1.67 ±4.44	
Sexual dimorphism (%)				Level of Significant	
Traits (%)	Brown		White		Sig.
Gizzard fat	19.24 ^b ±7.17		-37.41 ^a ±12.48		0.001
Abdominal fat	19.92±5.28		80.16±76.41		N.S
Wings	4.81 ^b ±1.52		13.56 ^a ±5.39		0.03
Neck	9.83 ^b ±0.79		30.98 ^a ±16.16		0.01
Skin	15.02±1.56		35.30±19.09		0.05
Skeleton	10.08±1.48		22.66±13.28		N.S
Bursa	-7.17±4.25		18.38±39.60		N.S
Spleen	14.29±1.43		14.09±34.36		N.S

^a and ^b Means within the same row with different letters are significantly different.

Correlation: Data presented in Tables (5, and 6) clarifies the correlation among carcass traits of both males and females on brown Domyati ducks, the gizzard fat recorded a medium positive correlation (0.6) with the body weight of males, while there was a high positive correlation with body weight (0.93) of

female, also male recorded medium and low positive correlation for bursa (0.46) and spleen (0.33), however, the female recorded high and medium positive correlation for bursa (0.72) and spleen (0.46). The relation among other traits in both males and females recorded a high positive correlation.

Data showed in Tables (7 and 8) the correlation of White Domyati duck on both males and females among carcass traits, our results confirmed that no correlation was found between gizzard fat and body weight in the white duck males, however, there was a high positive correlation between gizzard fat and body weight of white female duck. There were low and medium negative correlations among gizzard fat with giblets, abdominal fat, major muscles, wings, skeleton, bursa, spleen, heart, gizzard, blood, and viscera of the white male, the opposite trend was noticed for a white female, which the relation among gizzard fat with other traits was a high positive correlation. However, most of the relations among traits had a high positive correlation between both males and females. Ojo et al. (2014) reported a relationship between BW and linear body measurements (BL, wing length, SL, shank diameter, drumstick, and body girth) of 108 birds (*Coturnix coturnix japonica*) at the age of two, four, and eight weeks respectively (Ojo et al., 2014).

Regression: Multiple regression analysis has been used to interpret the complex relationship between body weight and some body measurements in several animals (Cankaya et al., 2006; Akar et al., 2001). Due to the dimorphism between males and females, multiple linear regression analysis was performed on data sets based on sexes, Figures (2, 3, 4 and 5) and Table (9). This was to analyze the data set to find out the magnitude of the interrelationship among the independent variables (live body weight

for males and females) and dependent variables values (non-edible and edible meat parts). The Intercept, Slope, standard error (SE), t-value, p-value, Coefficient of Determination (R²), and R adjustment for the two sexes in each phenotype are summarized in Table (9). P value was significant for all phenotypes. Also, the intercepts are negative for edible meat parts on both males and females, The R² adjusted R² is higher on all phenotypes for males and females. Ogah et al (2009) found that Body length, bill length, bill height, neck length, and head width were found to be insignificant for Muscovy males while body length, bill length, bill height, shank length, and chest circumference were insignificant for the female traits. Though several independent variables were negligible, R² and adjusted R² are useful statistics tools for comparing models as they measure the goodness of fit of a regression model. Though R² measures the proportion of variance in the dependent variable explained by the regression, it always increases as new independent variables are included in the model even if they don't possess any relationship with the dependent variable. Thus, the adjusted R² which is adjusted for the number of independent variables in the model may be a better measure of the goodness of fit for a regression model (Raji et al., 2010; Neter et al., 1989).



Figure (1): Photo of Brown (A) and White (B) Domyati ducks

Table (5): Pearson Correlations with significance between body weight and non-edible and fats for Brown Domyati duck “males=Upper” – “females=Lower”

	BW	GizzardFat	Abdom.Fat	skeleton	Bursa	spleen	Blood	feather	leg	head	viscera
BW	1	.611	.940	.951	.463	.326	.982	.982	.993	.969	.881
		.002	.000	.000	.026	.138	.000	.000	.000	.000	.000
Gizzard Fat	.927	1	.682	.708	.893	.901	.605	.641	.603	.713	.233
	.000		.000	.000	.000	.000	.003	.001	.003	.000	.322
Abdom.Fat	.963	.961	1	.915	.581	.438	.923	.930	.915	.964	.817
	.000	.000		.000	.004	.041	.000	.000	.000	.000	.000
Bursa	.719	.769	.723	.595	1	.968	.445	.460	.432	.576	-.082
	.000	.000	.000	.003		.000	.033	.027	.040	.004	.722
Spleen	.474	.438	.414	.317	.844	1	.320	.274	.306	.444	-.281
	.022	.037	.050	.140	.000		.146	.218	.166	.038	.229
Blood	.891	.934	.895	.818	.928	.681	1	.971	.986	.959	.859
	.000	.000	.000	.000	.000	.000		.000	.000	.000	.000
Feather	.956	.971	.974	.911	.828	.516	.955	1	.977	.970	.890
	.000	.000	.000	.000	.000	.012	.000		.000	.000	.000
Leg	.975	.934	.974	.965	.667	.372	.876	.946	1	.963	.880
	.000	.000	.000	.000	.001	.080	.000	.000		.000	.000
Head	.972	.975	.979	.958	.711	.401	.906	.971	.978	1	.802
	.000	.000	.000	.000	.000	.058	.000	.000	.000		.000
Viscera	.914	.874	.870	.851	.933	.813	.964	.923	.852	.873	1
	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	

** . Correlation is significant at the 0.01 level (2-tailed).

* . Correlation is significant at the 0.05 level (2-tailed).

Table (6): Pearson Correlations with significance between body weight and edible and fats for Brown Domyati duck “males=Upper” – “females=Lower”

	BW	Giblets	thigh	drum	major	Minor	wings	Neck	skin	liver	gizzard	heart
BW	1	.973	.975	.970	.946	.977	.942	.980	.985	.956	.959	.947
		.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
Giblets	.911	1	.974	.938	.956	.955	.970	.954	.956	.922	.956	.970
	.000		.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
Thigh	.948	.929	1	.923	.915	.978	.980	.949	.972	.905	.951	.971
	.000	.000		.000	.000	.000	.000	.000	.000	.000	.000	.000
Drum	.975	.845	.932	1	.921	.921	.880	.970	.968	.938	.929	.894
	.000	.000	.000		.000	.000	.000	.000	.000	.000	.000	.000
Major	.965	.837	.926	.980	1	.899	.901	.948	.913	.952	.920	.900
	.000	.000	.000	.000		.000	.000	.000	.000	.000	.000	.000
Minor	.961	.901	.963	.940	.954	1	.940	.961	.967	.931	.935	.938
	.000	.000	.000	.000	.000		.000	.000	.000	.000	.000	.000
Wings	.934	.918	.987	.911	.895	.953	1	.896	.939	.844	.958	.982
	.000	.000	.000	.000	.000	.000		.000	.000	.000	.000	.000
Neck	.965	.845	.932	.970	.983	.969	.907	1	.959	.974	.919	.909
	.000	.000	.000	.000	.000	.000	.000		.000	.000	.000	.000
Skin	.980	.884	.957	.968	.974	.976	.941	.985	1	.932	.951	.924
	.000	.000	.000	.000	.000	.000	.000	.000		.000	.000	.000
Liver	.912	.948	.978	.877	.881	.934	.972	.883	.914	1	.869	.843
	.000	.000	.000	.000	.000	.000	.000	.000	.000		.000	.000
Gizzard	.898	.963	.900	.820	.816	.882	.898	.806	.860	.906	1	.955
	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000		.000
Heart	.979	.918	.972	.975	.976	.972	.955	.973	.982	.943	.886	1
	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	

**** . Correlation is significant at the 0.01 level (2-tailed).**

*** . Correlation is significant at the 0.05 level (2-tailed).**

Table (7): Pearson Correlations with significance between body weight and non-edible parts for White Domyati duck “males=Upper” – “females=Lower”

	BW	GizzardFat	Abdom.Fat	skin	Bursa	Spleen	Blood	feather	leg	head	viscera
BW	1	.012	.992	.959	.824	.915	.964	.942	.954	.974	.937
		.985	.001	.010	.086	.029	.008	.017	.012	.005	.019
Gizzard Fat	.976	1	-.105	.089	-.482	-.105	-.148	.031	-.071	.112	-.140
	.005		.867	.887	.411	.866	.812	.960	.910	.857	.823
Abdom.Fat	.910	.884	1	.945	.869	.913	.966	.920	.957	.955	.934
	.032	.047		.015	.056	.030	.007	.027	.011	.011	.020
Skin	.784	.858	.891	1	.807	.946	.884	.938	.987	.997	.861
	.116	.063	.042		.099	.015	.047	.018	.002	.000	.061
Bursa	.897	.927	.943	.926	1	.920	.887	.852	.891	.799	.885
	.039	.023	.016	.024		.027	.045	.067	.043	.105	.046
Spleen	.820	.895	.889	.996	.930	1	.918	.976	.973	.944	.926
	.089	.040	.044	.000	.022		.028	.005	.005	.016	.024
Blood	.901	.950	.910	.960	.920	.979	1	.949	.908	.907	.993
	.037	.013	.032	.010	.027	.004		.014	.033	.034	.001
Feather	.936	.902	.716	.576	.701	.639	.773	1	.943	.953	.961
	.019	.036	.174	.310	.187	.246	.126		.016	.012	.009
Leg	.783	.857	.893	1.000	.928	.995	.958	.573	1	.979	.889
	.117	.063	.042	.000	.023	.000	.010	.313		.004	.044
Head	.877	.947	.864	.956	.907	.979	.994	.761	.954	1	.887
	.051	.015	.059	.011	.034	.004	.001	.135	.012		.045
Viscera	.856	.908	.934	.976	.986	.975	.950	.646	.977	.941	1
	.064	.033	.020	.004	.002	.005	.013	.239	.004	.017	

******. Correlation is significant at the 0.01 level (2-tailed).

*****. Correlation is significant at the 0.05 level (2-tailed).

Table (8): Pearson Correlations with significance between carcass traits for White Domyati duck “males=Upper” – “females=Lower”

	BW	thigh	drum	Major	minor	wings	neck	liver	gizzard	heart
BW	1	.950	.909	.908	.954	.986	.815	.896	.869	.952
		.013	.033	.033	.012	.002	.093	.040	.055	.013
Thigh	.893	1	.988	.942	.983	.951	.825	.984	.865	.940
	.041		.002	.017	.003	.013	.085	.002	.058	.017
Drum	.818	.942	1	.910	.945	.916	.873	.973	.879	.914
	.091	.017		.032	.015	.029	.054	.005	.049	.030
Major	.785	.941	.937	1	.944	.955	.717	.908	.882	.976
	.116	.017	.019		.016	.011	.173	.033	.048	.005
Minor	.972	.904	.905	.842	1	.946	.723	.978	.796	.925
	.005	.035	.035	.074		.015	.167	.004	.107	.024
Wings	.987	.838	.721	.701	.925	1	.823	.888	.923	.990
	.002	.076	.169	.187	.025		.087	.044	.026	.001
Neck	.954	.902	.772	.844	.901	.949	1	.744	.923	.819
	.012	.036	.126	.072	.037	.014		.149	.025	.090
Liver	.867	.912	.983	.900	.954	.778	.792	1	.771	.874
	.057	.031	.003	.037	.012	.122	.110		.127	.052
Gizzard	.964	.966	.941	.897	.983	.913	.921	.957	1	.949
	.008	.007	.017	.039	.003	.030	.026	.010		.014
Heart	.840	.917	.867	.972	.859	.783	.923	.853	.896	1
	.075	.028	.057	.005	.062	.117	.025	.066	.039	

**** . Correlation is significant at the 0.01 level (2-tailed).**

*** . Correlation is significant at the 0.05 level (2-tailed).**

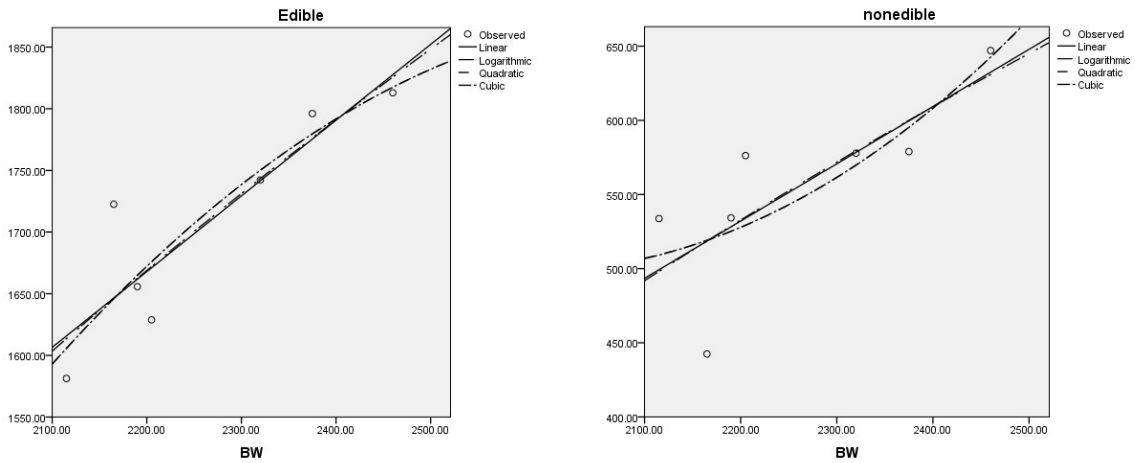


Figure (2): Linear and Non-linear regression relationship between LBW and edible ($R^2 = 0.984$), Non-edible parts ($R^2 = 0.765$), for brown Domyati duck males

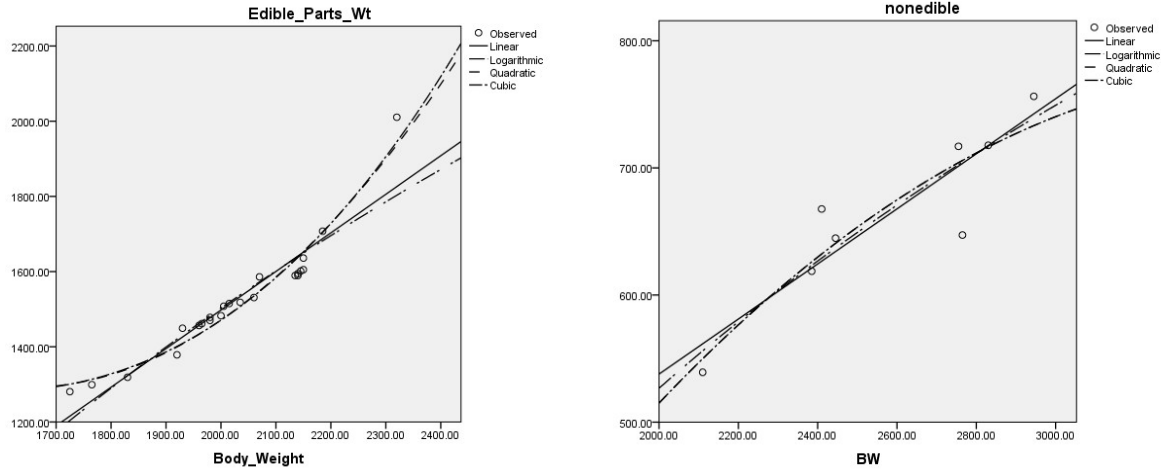


Figure (3): Linear and Non-linear regression relationship between LBW and edible ($R^2 = 0.977$), non-edible parts ($R^2 = 0.936$), for brown Domyati duck females

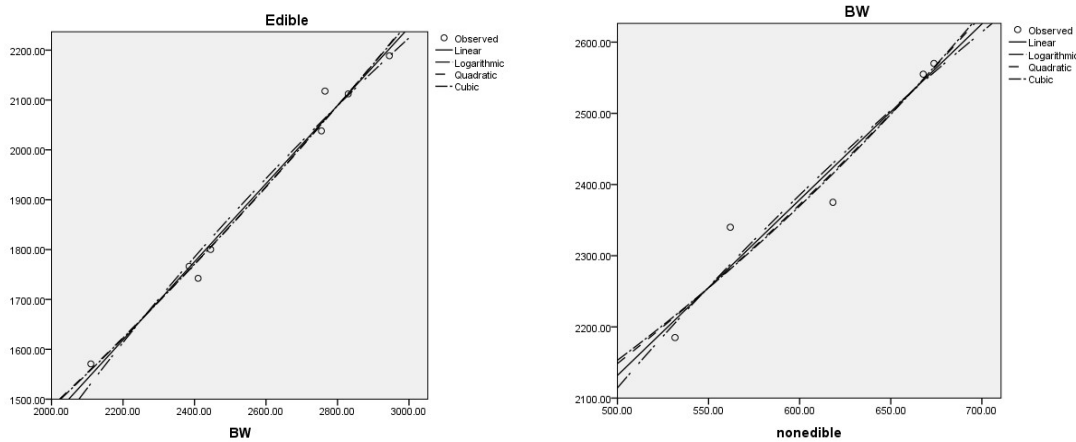


Figure (4): Linear and Non-linear regression relationship between LBW and edible ($R^2 = 0.980$), Non-edible parts ($R^2 = 0.873$), for White Domyati duck males

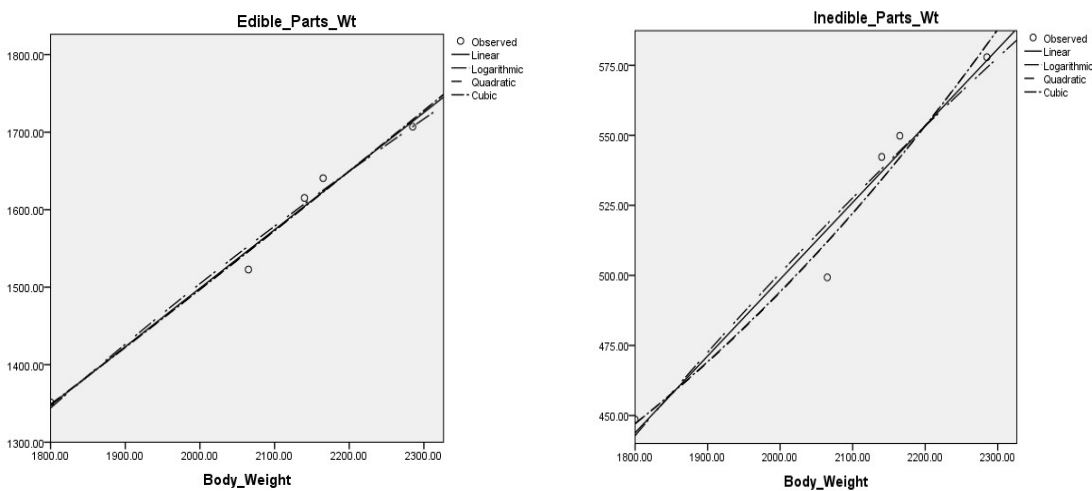


Figure (5): Linear and Non-linear regression relationship between LBW and edible ($R^2 = 0.985$), Non-edible parts ($R^2 = 0.963$), for White Domyati duck females

Table (9): Regression analysis for body weight (independent) and non- and edible meat parts(dependent) among phenotypes of Domyati ducks on male and female.

Traits (X)	LBW (Y) Male					
	Black feather				Equation	p-value
Intercept	Slope ± SE	R ²	Adjusted R ²			
	White feather					
Non-edible	104.562	0.217± 042	0.873	0.788	Y=104.562+ 0.217 X	0.002
Edible	-104.562	0.783 ± .042	0.980	0.983	Y=104.562+ 0.783 X	0.0001
	Brown feather					
Non-edible	159.552	0.189 ± .047	0.765	0.718	Y=159.552+ 0.811 X	0.01
Edible	-159.552	0.811± 0.047	0.984	0.980,	Y=-159.552+ 0.799	0.0001
	LBW (Y) Female					
	White feather					
Non-edible	-317.205	0.386± 0.141	0.599	0.519	Y=-317.205+ 0.185 X	0.041
Edible	317.205	0.614 ± 0.141	0.791	0.749,	Y=-207.710+ 0.843 X	0.007
	Brown feather					
Non-edible	154.819	0.179± .027	0.936	0.915	Y=154.819+ 0.823X	0.007
Edible	-154.819	0.821 ± .027	0.977	0.976	Y=-154.819+ 0.821 X	0.0001

Conclusions

We can summarize the previous results in that there is an effect of feather color on sexual dimorphism for carcass characteristics, and the correlation between the characteristics was highly positive. Also, the regression analysis was significant, and the R² was high. Therefore, the Domyati duck can be separated into two distinct phenotypes.

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