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ESTIMATION OF GENETIC PARAMETERS FOR WEIGHTS AT DIFFERENT AGES IN LOCAL IRAQI BUFFALOES

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Abstract

This study was conducted at Al-Qadisiyah province by using (37 calves and 43 heifers) of Iraqi buffaloes which are belonging to ten sires and to dams with three groups of age (3-4.5, 5-6.5 and 7 years and over) and five parities from one to five parity. The weight at birth (BW0), weight at two months (BW2), weight at four months (BW4) and weight at six months of age (BW6) were recorded. The aim of this study was to estimate the effect of the sire, age of dam, parity of lambing and sex of calf on previous characters, also to estimate the heritability of these weights and genetic and phenotypic correlations among these weights. The results of the current study can be summarized as follows: The overall means of BW0, BW2, BW4, and BW6 were 37.711, 77.404, 105.032 and 126.095 kg respectively, these weights were significantly ($p<0.05$ or $p<0.01$) affected by the sire, age of dam, parity of lambing and sex of calf accept the effect of sire on BW0.The heritability estimates of previous weights were 0.136, 0.766, 0.500 and 0.540, respectively. The genetic and phenotypic correlations among weights at different ages were moderate to highly which were ranging from 0.200 to 900 and 0.250 to 0.772, respectively. From the results of this study, it could be said that genetic correlations are essential in an indirect response to selection and also give information that genes affecting one trait also affect other traits.

Keywords: Iraqi buffaloes, Weights, heritability, genetic and phenotypic correlations.

Introduction

Iraq is basically an agricultural country with a majority of the population depends on agriculture and animal production consists of 50% of agriculture production, the number of buffaloes in Iraq was 302 thousand, FAO (2007) and FAO (2013). The important economic traits in buffaloes include milk yield and the birth weight of buffalo which is higher than the birth weight of cows, the birth weight of buffalo in Iraq ranging from 37 to 43 kg, Al-Amin *et al.* (1988); Baghdasar (1990); Khan *et al.* (1996); and Al-Hellou (2012). Selection for high weights in buffaloes due to arrival to the age of sexual puberty, in addition to improving the ability of the work of these animals in order to demonstrate the true genetic merit of animals, it is necessary to study the genetic and non-genetic factors affecting weights at different ages for the purpose of accurately assessing animals on genetic basis, Moran (1992); Alves *et al.* (2015). Several works have been reported that sire, age and parity of dam and sex of buffalo calves significantly affected weights at bright two months, four months and six months of age, Andy, A.E., El-Shafie, *et al.* (1999); Zaman *et al.* (2007); Thiruvenkadan *et al.* (2009); and Shankar *et al.* (2010)

Pandya *et al.* (2015). Several scientists reported the heritability estimates for weights at different ages ranging 0.11 to 0.86, Tien *et al.* (1990); Alim, (1991); Thevamanoharan *et al.* (2000); Thevamanoharan, *et al.* (2001); and Manjor *et al.* (2014). There are very few studies about the estimation of genetic parameters for weights at birth, two months, four months and six months at the age in buffalo in Iraq, accept once the study was conducted to estimate the heritability of birth weight by Bushra Abed Jeber and Hussein M. Khaeim. (2019), so this study was conducted to estimate genetic parameters for previous traits (heritability, genetic and phenotypic correlations, in addition to finding the effect of the sire, age of dam, parity of lambing and sex of buffalo calves on these weights.

Materials and Methods

This study has been conducted at Al- Qadisiyah province during 2019 by using (37 calves and 43 heifers) of Iraqi buffalo which are belonged to ten sires and to dams with three groups of age (3-4.5, 5-6.5 and 7 years and over) and with five parity of lambing. Weights of buffalo calves at birth (BW0), two months (BW2), four months (BW4) and weight at six months of age (BW6) were recorded by weighing with the mechanic scale with 150 kg. As a result of the scarcity of studies on the assessment of genetic parameters (heritability, genetic and phenotypic correlations). This study has been conducted to find the effects of the sire, age of dam, parity of lambing and sex of calf on body weights at birth (W0), weight at two months (W2), weight at four months (W4) and weight at six months of age (W6). Also to estimate the heritability of previous traits and genetic and phenotypic correlations among weight at different ages. The observations of different weights were analyzed by using SAS Program, SAS. (2012), the following mixed model used to estimate the effect of factors on previous traits:

$$Y_{ijklm} = \mu + R_i + A_j + P_k + S_l + e_{ijklm}$$

Y_{ijklm}: the observation values

μ: the overall mean.

R_e: the effect of the sire (I = 1 to 10)

A_j: the effect of the j^{th} age of dam (j =3-4.5, 5-6.5 and 7 years and over)

P_k = the effect of P^{th} parity of dam (p= 1 to 5)

S_l = the effect of the S^{th} sex of buffalo calves (1= 1, 2).

e_{ijklm}: random errors

The heritability and genetic and phenotypic correlations were estimated by using the questions which are demonstrated by Falconar, D.S. (1990).

Results and Discussion

The overall means for BWO, BW2, BW4, and BW6 were found to be 37.711, 77.404, 105.032 and 126.059 kg respectively, as presented in table 1. Similar results for birth weight in Iraqi buffalo were demonstrated by Usmani *et al.* (1987) in Nali-Ravi buffaloes, Khan *et al*. (1996) in Mehsana buffalo and Al-Helou *et al*. (2012) in Iraqi buffalo. The birth weight in the present study is lower than demonstrated by Al-Amin, *et al.* (1988) and Baghdasar, (1990) in local Iraqi buffaloes, due these studies were conducted in government stations where conditions of breeding and care are available. However, the weights for BW2, BW4, and BW6 in the current study were higher than weights reported by, Raghavan *et al.* (1987) in Surti buffalo, Raja Gopalan *et al.* (1989), Naqvi *et al*. (1999) in Nili-Ravi buffalo calves, Thevamanoharan *et al.* (2001) in Swamp buffalo Assam, Zaman *et al*. (2007) in Swamp buffalo Assam, Thiruvenkadan *et al.* (2009) in Murra buffaloes, Pandya, *et al.* (2015) in surti buffalo and Kumar *et al.* (2017) and Khaeim, *et al.* (2019) in Murrah buffalo. These differences among weights may be due to breed and environmental conditions.

Table 1 : The overall means ± standard errors for body weights at different ages.

Traits / Factors	BW0	BW2	BW4	BW6
Sire 1	36.386 ±0.074	74.94±1.124	102.791±1.650	126.214±1.146
2	37.527±0.718	96.211±1.197	103.282±1.756	123.399±1.219
3	36.797±0.844	74.099±1.407	100.607±2.065	126.947±1.434
4	38.634±0.744	78.264±1.241	105.430±1.820	124.937±1.264
5	37.100±0.807	75.531±1.346	103.483±1.975	124.570±1.372
6	37.929±0.622	77.562±1.104	104.508±1.619	125.436±1.125
7	38.235±0.755	78.479±1.259	105.902±1.847	126.510±1.283
8	36.717±0.708	78.556±1.180	107.950±1.731	125.022±1.202
9	38.108±0.668	79.573±1.113	107.145±1.634	127.929±1.135
10	39.727±0.741	80.867±1.236	109.220±1.813	129.981±1.259
	N.S	**	*	*
Age of dam/year 3-4.5	a 36.883±0.496	a 77.370±0.827	a 102.661±1.213	a 124.242±0.842
5-6.5	ab 37.743±0.454	a 77.626±0.756	ab 105.884±1.110	ab 126.343±0.771
7 years and over	b 38.507±0.596	a 77.217±0.994	b 105.55±1.458	b 127.699±1.013
	*	N.S	*	*
Parity of lambing 1	a 36.074±0.665	a 74.048±1.108	ac 102.097±1.626	ac 123.318±1.129
2	bc 38.622±0.631	bd 78.819±1.053	b 107.913±1.545	b 127.556±1.073
3	cd 37.376±0.464	ac 75.945±0.774	c 103.5341.136	bc 125.724±0.789
4	de 38.236±0.613	d 78.881±1.023	c 105.406±1.501	b 127.420±1.042
5	e 38.246±0.762	d 79.329±1.171	c 106.209±1.865	a 126.454±1.296
	*	*	*	*
Sex male	a 39.198±0.371	a 79.891±0.618	a 109.306±0.906	128.060±0.630
Female	b 36.223±0.335	b 74.918±0.558	b 100.758±0.818	121.872±0.568
	**	**	**	**
Over all means	37.711±0.231	77.404±0.385	105.032±0.565	126.095±0.393

* : significant of 5% level.
** : significant of 1% level.
Different letters in columns indicate a significant difference.
Similar letters in columns indicate the non-significant difference.

Table (1) explain the effects of the sire, age of dam, parity of lambing and sex of buffalo calves on weights at different ages. BW2, BW4, and BW6 were significantly (P< 0.05) or (P<0.01) affected by sire, a sire with numbers 10 and 9 inquired higher weights compared to other sites. Mahdy *et al.* (1999) and Pandya *et al.* (2015) have also reported that sire affected significantly (P<0.01) weights at all ages birth weight, 3, 6, and weight at 12 months of age. In this study was noticed that the age of dam affected significantly (P<0.01) BW0, Bw4, and BW6. There is an increase in

weights with the progressing age of the dams. This result is similar to the findings of Al-Hellou (2012) and Khaeim *et al.* (2019) in local Iraqi buffaloes. The parity of lambing had a significantly (P<0.01) effect on BW0, BW2, BW4, and BW6. Also, it was found that the lowest weight of calves was for dams with first parity compared to other parities of dams, generally, there is an increase in weights with the progress of parity of dams. Al-Helou, *et al.* (2012) reported that dams with first parity produce lighter weights (35.407 kg) compared to dams with third parity which produced heavyweights as 39.407 kg. This explains that skeletal maturity of the animals attained at this age when animals are in the third party. A similar finding was found by Rao *et al.* (1996). The effects of sex were found to be highly significantly (P<0.01) for BW0, BW2, BW4 and BW6, males were higher significantly (P<0.01) than females at all ages. Rao *et al.* (1996) have been reported that males were higher significantly weight than females. The increase in body weight probably arises from the increasing differences in the endocrine system between males and females, Swenson, *et al.* (1990). Heritability estimates for the BW0, BW2, BW4, and BW6 are presented in (Table 2). Heritability values for previous traits were 0.136, 0.766, 0.500 and 0.540, respectively.

Table 2 : Estimates of heritability (along diagonal) genetic correlation (above diagonal) and phenotypic correlation among weights at different ages.

Traits	BW0	BW2	BW4	BW6
BW0	0.136	0.662	0.210	0.240
BW2	0.770	0.766	0.900	0.230
BW4	0.772	0.250	0.500	0.200
BW6	0.562	0.650	0.633	0.540

The heritability for BW0 in the present study was lower to moderately heritable in Iraq buffalo. Similar results were reported by Thiruvenkadan, A.K., pannier Selvam, S., and Rajendran, R. (2009) in Murra buffalo, Manjor *et al.* (2014), 0.13 in Sahiwal heifers and Pandya *et al.* (2015) as 0.188 in surti buffalo, The heritability estimates ranging from 0.11 to 0.40 have been observed by Kirmani, S.M. S., Rao, *et al.* (1984); Topaurak (1991) and Ayyat *et al.* (1997) in various breeds. In this present study, the estimates of heritability for BW2, BW4, and BW6 were moderate to highly heritable in Iraq buffaloes. Also, when the heritability of a trait is high, the correlation between phenotype and genotype should be effective and the value of heritability explains the relative between phenotype and genotype, therefore helps in choosing the suitable selection method by mating the best to the best Kirmani *et al.* (1984); Topaurak (1991) and Ayyat *et al.* (1997). The heritability estimates for weight at 3 months and 6 months of age ranging from 0.15 to 0.86 were demonstrated by Hussein M. Khaeim, *et al.* (2019). The wide variation in the heritability estimates among researches could be due to several factors such as (size of the sample, environmental factors, number of sires, number of sons per each sire, a linear model used). Genetic and phenotypic correlations among body weights at different ages presented in (Table 2). Genetic correlations of BW0 with BW2, BW4, and BW6 were 0.662, 0.210 and 0.240, respectively. Genetic correlations of BW2 with BW4 and BW6 were found to be 0.900 and 0.230, respectively. Also, the genetic correlation between BW4 and BW6 was 0.200. The genetic correlations among weight at different ages were moderate to high as 0.200 to 0.900. Different values of genetic correlations ranging from 0.09 to 1.089 have been demonstrated by Khaeim, H.M. (2013). From the results of this study, it could be said that genetic correlations are essential in an indirect response to selection and also give them information that genes affecting one trait also affect other traits. Table (2) shows the phenotypic correlations of BW0 with BW2, BW4, and BW6 were 0.770, 0.742 and 0.662, respectively. The phenotypic correlations of BW2 with BW4 and BW6 were 0.250 and 0.650, respectively, also the correlation between BW4 and BW6 was 0.633. The phenotypic correlation between BW0 and BW3 ranged from 0.388 to 0.512 Wafaa Alawsy, *et al.* (2018) and, BW0, and BW6 were 0.06 to 0.425, Luma, A. Alabadi, *et al.* (2018) and the phenotypic correlation between BW3 and BW6 was 0.671 to 0.841 (13, and 11).

Conclusion

Generally, genetic and non-genetic factors significantly affected the weights at all ages. From the results, the values of heritability estimates for weights were moderate to high, also the genetic and phenotypic correlations among weights were also moderately to highly.

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