



Study the effect of some factors on the conformation of Iraqi Arabian horses

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Abstract:

This study is conducted on (55) Iraqi Arabian horses with different sub breeds (AL-Muanigi,AL-Hamdani,AL-Kuhailan and AL-Saklawi),the ages ranged 12-240 months for both sexes (males and females) and with different colures (White, Black, Red, Brown).The current study aims to estimate the effect of sub breed of horses sex, age and color on different body measurements of wither height (WH),Croup height (CH),Body length (BL),Chest girth (CG),abdomen girth (AG),length of 3rd metacarpal bone (L3rdMB),Circumference of 3rd metacarpal bone (C3rdMB),length of backline (LBL),head length (HL),length of hind lamb (LHL),and arm length (AL) and hand length (HL),respectively indices for backline, chest girth, body shape, body length and body height.

The results can be summarized as follows:

The overall means $\pm$ their standard errors of body measurement of Iraqi horses are 145.434 ± 1.963 , 155.814 ± 2.688 , 155.814 ± 2.688 , 165.354 ± 2.932 , 165.332 ± 3.467 , 30.779 ± 3.406 , 18.144 ± 0.310 , 76.140 ± 1.212 , 64.614 ± 0.493 , 136.223 ± 1.517 , 40.227 ± 0.859 and 41.179 ± 1.006 can for WH, CH,BL, CG,AG, L3rdMB, c3rdMB, LBL,HL,LHL,AL and HAL respectively. Generally, there are significant ($P < 0.05$) increases in the body measurements with age progress; Mares have recorded arithmetically superiority in all measurements except (AG) and (LBL) as compared to stallions.

AL-muanigi and AL-Saklawi sub breeds in equine arithmetic and significant ($P < 0.05$) superiority in most measurements as compared with AL-Hamdani and AL-Kuhailan Sub-breeds.

The results show that overall means of line, chest girth, body shape, body length and wither height are 52.411 ± 0.826 , 113.777 ± 1.549 , 107.212 ± 1.521 , 205.051 ± 3.247 and 99.736 ± 0.648 %respectively.

The results explain that color of horses affects body shape also the high value for body shape index (107.212%) and body length index (205.051%) refer to the ability to burden the weight of the horseman for longer distances and also the shortness of the back line 76.140 cm. comparison with body length (155.814 cm) explain that Iraqi Arabian horse have ability in races high lyses for long distances.

Highly significant ($P < 0.01$) correlation coefficients among most different Body measurements are found (table – 3).

Keywords: Iraqi horses,Body measerments,Indises,correlation and regression coefficients

دراسة تأثير بعض العوامل على التكوين الخلقي للخيول العربية العراقية

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الخلاصة:

اجريت هذه الدراسة على (55) جواد من النسل العربي بمختلف الارسان (المعنقي-الحمداني-الكحيلان-الصقلاوي)، تراوحت اعمارها (12-240) شهر لكلا الجنسين ولمختلف الالوان (الاشهب، الادهم، الكمي، الاشقر). هدفت الدراسة الى تقييم تأثير عوامل الرسن، الجنس، العمر، اللون على قياسات الجسم المختلفة ارتفاع الحارك (WH)، ارتفاع الكفل (CH)، طول الجسم (BL)، محيط الصدر (CG)، محيط الخصر (AG)، طول العظم المشطي الثالث (L3rdMB)، محيط العظم المشطي الثالث (C3rdMB)، طول خط الظهر (LBL)، طول الرأس (HL)، طول القائمة الخلفية (LHL)، طول القائمة الامامية (AL)، طول اليد (HAL) على التوالي. وكذلك تم احتساب ادلة خط الظهر، محيط الصدر، شكل الجسم، طول الجسم، ارتفاع الجسم. اظهرت نتائج الدراسة ان المتوسط العام لقياسات $\pm$ الخطأ القياسي الجسم للخيول العراقية هي كالتالي: 145.434 ± 1.963 ، 155.814 ± 2.688 ، 155.814 ± 2.688 ، 165.332 ± 2.932 ، 3.467 ± 1.517 ، 40.227 ± 0.493 ، 136.223 ± 1.212 ، 64.614 ± 0.310 ، 76.140 ± 3.406 ، 18.144 ± 30.779 ، 1.006 ± 0.859 ، 41.179 سم ل (WH)، (CH)، (BL)، (CG)، (AG)، (L3rdMB)، (LBL)، (HL)، (LHL)، (AL)، (HAL) على التوالي. و اظهرت النتائج ان هناك زيادة معنوية بمستوى ($P < 0.05$) في قياسات الجسم مع تقدم العمر وكما سجلت الافراس تفوقاً حسابياً في جميع القياسات باستثناء محيط الخصر (AG) وطول خط الظهر (LBL) مقارنة بالخيول الطلوق، اضافة الى التفوق بمستوى ($P < 0.05$) كما اظهرت ارسان المعنقي والصقلاوي تفوقاً معنوياً ($P < 0.05$) في معظم قياسات الجسم مقارنة مع ارسان الحمداني والكحيلان. كما بينت النتائج ان المتوسط العام لأدلة طول خط الظهر ومحيط الصدر وشكل الجسم وطول الجسم وارتفاع الحارك كانت : $52,411 - 113,777 - 107,212 - 205,051 - 99,736\%$ على التوالي. و اوضحت النتائج ان اللون يؤثر في شكل الجسم وكما ان قيمه المرتفعة لدليل شكل الجسم ($107,212\%$) ودليل طول الجسم ($205,051\%$) مما يفسر قابلية الخيل العراقية لحمل وزن الفارس ولمسافات طويله وكما ان قصر طول خط الظهر ($76,140$) سم مقارنة مع طول الجسم ($155,814$) سم وهذا يبين بوضوح قابلية التحمل للخيول العراقية في سباقات المسافات الطويلة. و اكدت النتائج ان معاملات الارتباط بين قياسات الجسم المختلفة كانت عالية المعنوية ($P < 0.01$) كما موضح في الجدول (3).

الكلمات المفتاحية: خيول عراقية، قياسات الجسم، الأدلة، معاملات الارتباط والانحدار.

Introduction:

Many researchers were very interested with Arabian horses , not for its exterior but also for a peculiar conformation of anatomical-physiological characteristics such as a rapid increase in limb growth rate and resistance to injuries of bones(1),(2).The value of Arabian horses is mainly associated with their exterior conformation, because this particular breed is used primarily for presentations. Therefore, the major criterion for their

assessment is their aesthetic value, as well as, their correct body composition(3).

Attempts to characterize the morphometrical pattern had been taken repeatedly for many horse breeds in recent years (4),(5),(6).

Interestingly, the comparison of Arabian with Thoroughbreds showed that limb injuries were significant less frequent in Arabian horses (2). It was also found that Thoroughbreds differ from other breeds,

not only with regard to segment lengths but also with regard to joint angles(7).

Biometric studies narrowed down only to Arabian horses mainly apply to populations in Spain, Iran, Egypt(8),(9),(10). On the basis of the Spanish population it was found that some of the exterior parameters revealed significant differences between animals bred for morphological shows and for endurance races(6). In view of these data, a question arises whether Arabian horses represent a different metric model in the countries where they are bred?. The aim of our study was to explain the effect of breed, age, sex and colour on the conformation (12 biometrical measurements) of the Iraqi Arabian sub-breed horses, we hope our results will be useful in selection programs.

Many researchers mentioned the differences of the horses bodies measurements according to the breed, age & sex(11),(12),(13)

(3) was conducted a study in three stud farms in Poland on 334 purebred Arabian horses (Kuhailan&Saklawi) types, they founded out of the 26 metrical traits, 10 features are increasingly significant when compared between them(the length of the metatarsus, pelvis, arms, the depth of the chest and neck).

Also (Orarcova *et.al.*,2013) studied the effect of age & sex on 6 body measurements Of Syrian Arabian horses (51 mares, 23 stallions& 135 foals) their ages ranged (1-72) months, the results showed that the body length, 3rd metacarpal bone circumference & weither height were increasing in males, while chest circumference and back line length was increased in females(foals&adult horses). The males showed the highest values of the rest body measurements.

The current study is aimed to estimate the effect of age , sex , breed and color on somebody measurements and their indices in addition to find the correlation

coefficients among different measurements.

Materials & Methods:

Thy study was conducted on (55) Iraqi Arabian horses with different sub breeds (al_muanigi,al _hamadani;al _kuhailan,al_saklawi and al_obiat)respectively ,the ages ranged(-240 12) months(15) ,both sex(male and female) and with different colures (white ,black ,red,brown) .

The management of these horses followed the open system ,they are fed on (grain, alfa alfa , hay ,vitamins and minerals) for three time daily and free drinking water.

Twelve body measurements were recorded by using of plastic measuring tape and measuring stick as follows:-

1-Wither height(WH) :The distance from the highest point of the processes spinali of the second to the sixth thoracic vertebrae to the floor.

2-Croup height(CH):the distance from the sacral tuber and the floor.

3-Body length(BL):the distance from the greater tubercle of humerous and the ischial tuberosity.

4-Chest girth(CG):The circle around the chest which passed from the tip of the wither and the back of the forelimbs.

5-Abdominal (AG): the circle around the abdomen which passed from the tip of the spines of lumber vertebrae and in front of the hind limbs.

6-Length of the3rd metacarpal bone(L3rdMB):The distance between the proximal epiphysis of 3rd metacarpal bone and the middle point of fetlock joint.

7-circumference of the 3rd metacarpal bone(CrdMB):The circle around the body of the 3rd metacarpal bone.

8-Length of back line(LBL):The distance from anterior point of the wither to the tip of the tail.

9-Head length(HL):The distance from the middle point between the ears and the border of the upper lip.

10-Arm length(AL):The distance from the shoulder joint to the ground.

11-Hand length(HAL):The distance from the carpal joint to the ground.

12-Length of the hind limb(LHL):The distance from the tuber coxi of the illum to the ground.

However the indices of somebody measurements have estimated by using the following equations:-

1- Index for length of back line = $\text{length of back line} / \text{withers height} \times 100$.

2- Index of chest girth = $\text{chest girth} / \text{withers height} \times 100$.

3- Index of body shape = $\text{body length} / \text{withers height} \times 100$.

4- Index of body length = $\text{body length} / \text{length of back line} \times 100$.

5- Index of body height = $\text{withers height} / \text{croup height} \times 100$.

In addition to study the effect of previous factors on different indices of body measurements are evaluated.

The results have been analyzed by using factorial experiment depending on SPSS programme (16) to find the effect of age of horses, sex , breed and colour on previous measurements.

Table-1- The overall mean of body measurements(CM) $\pm$ Standard erros

	WH	CH	BL	CG	CA	L3rdMB	C3rdMB	LBL	HL	LHL	AL	HAL
Age (YEAR)												
1-3	abc139.378 2.603 $\pm$	a140.977 2.323 $\pm$	145.469ab $\pm$ 3.561	150.833a $\pm$ 3.887	149.147a $\pm$ 4.608	30.994 $\pm$ 4.515	17.304abc $\pm$ 0.410	70.317ab $\pm$ 1.607	61.935ab $\pm$ 1.051	132.623a $\pm$ 2.011	39.898 $\pm$ 1.138	40.546 $\pm$ 1.333
3-5	bcde143.210 2.872 $\pm$	ab144.528 $\pm$ 2.564	153.124bcde $\pm$ 3.929	168.767bcde $\pm$ 4.289	171.206bcde $\pm$ 5.085	35.246 $\pm$ 4.982	17.436bcde $\pm$ 0.453	72.387b $\pm$ 1.773	62.936bcd $\pm$ 1.160	135.574ab $\pm$ 2.219	40.130 $\pm$ 1.256	41.775 $\pm$ 1.471
5-7	cde 148.902 3.610 $\pm$	ab149.314 $\pm$ 3.222	161.248cde $\pm$ 4.939	170.696cde $\pm$ 5.391	173.635cde $\pm$ 6.390	26.292 $\pm$ 6.282	18.563cde $\pm$ 0.569	80.049cde $\pm$ 2.229	65.747cde $\pm$ 1.457	140.110ab $\pm$ 2.789	40.205 $\pm$ 1.579	40.898 $\pm$ 1.849
7-9	de 148.902 3.610 $\pm$	b149.313 $\pm$ 3.222	161.248de $\pm$ 4.938	170.696de $\pm$ 5.391	173.635de $\pm$ 6.390	26.295 $\pm$ 6.282	18.563de $\pm$ 0.569	80.049de $\pm$ 2.2229	65.747de $\pm$ 1.457	140.110b $\pm$ 2.789	40.205 $\pm$ 1.579	40.898 $\pm$ 40.898
more than 9 years	e 148.202 3.522 $\pm$	ab147.047 $\pm$ 3.144	162.527e $\pm$ 4.819	171.598e $\pm$ 5.261	168.735e $\pm$ 6.236	33.306 $\pm$ 6.111	18.928e $\pm$ 0.555	79.209e $\pm$ 2.175	66.703e $\pm$ 1.422	136.625ab $\pm$ 2.721	40.592 $\pm$ 1.540	41.801 $\pm$ 1.804
Sex												
male	143.107 3.013 $\pm$	144.258 2.689 $\pm$	154.307 $\pm$ 4.122	163.506 $\pm$ 4.500	165.578 $\pm$ 5.334	28.840 $\pm$ 5.227	17.862 $\pm$ 0.475	76.484 $\pm$ 1.860	64.434 $\pm$ 1.216	135.229 $\pm$ 2.328	39.918 $\pm$ 1.318	40.382 $\pm$ 1.543
female	147.760 1.690 $\pm$	147.431 1.508 $\pm$	157.322 $\pm$ 2.312	167.202 $\pm$ 2.524	165.086 $\pm$ 2.991	32.718 $\pm$ 2.931	18.425 $\pm$ 0.266	75.797 $\pm$ 1.043	64.793 $\pm$ 0.682	137.216 $\pm$ 1.305	40.535 $\pm$ 0.739	41.975 $\pm$ 0.865
Breed												
AL-muanigi	146.709 3.676 $\pm$	146.256 3.281 $\pm$	155.540 $\pm$ 5.029	171.627 $\pm$ 5.495	171.841 $\pm$ 6.508	26.721abc $\pm$ 6.377	19.071 $\pm$ 0.580	75.832abcd $\pm$ 2.270	65.867 $\pm$ 1.484	137.850 $\pm$ 2.840	38.518 $\pm$ 1.608	42.700 $\pm$ 1.883
Al-Hamdani	143.013 2.949 $\pm$	142.400 2.631 $\pm$	151.119 $\pm$ 4.033	162.111 $\pm$ 4.403	161.772 $\pm$ 5.219	20.460bc $\pm$ 5.114	17.685 $\pm$ 0.465	72.882b $\pm$ 1.820	64.355 $\pm$ 1.190	133.916 $\pm$ 2.278	39.136 $\pm$ 1.289	38.461 $\pm$ 1.510
Al-Kehailan	146.227 2.403 $\pm$	146.555 2.145 $\pm$	155.186 $\pm$ 3.287	162.722 $\pm$ 3.589	163.242 $\pm$ 4.254	25.494c $\pm$ 4.168	17.734 $\pm$ 0.379	77.369cd $\pm$ 1.483	63.824 $\pm$ 0.970	136.194 $\pm$ 1.856	41.353 $\pm$ 1.051	41.373 $\pm$ 1.231
Al-saklawi	145.794 4.662 $\pm$	148.169 4.161 $\pm$	161.412 $\pm$ 6.378	164.956 $\pm$ 6.963	164.472 $\pm$ 8.253	50.441d $\pm$ 8.088	18.085 $\pm$ 0.735	78.478c $\pm$ 2.878	64.470 $\pm$ 1.882	136.930 $\pm$ 3.602	41.901 $\pm$ 2.039	42.180 $\pm$ 2.388

	WH	CH	BL	CG	CA	L3rdMB	C3rdMB	LBL	HL	LHL	AL	HAL
Colour												
Black	145.880 4.813±	146.910 4.296±	158.478 ± 6.585	161.882 ± 7.189	165.359 ± 8.522	27.508 ± 8.351	18.011 ± 0.759	81.843ac ± 2.972	64.849ab ± 1.943	137.265 ± 3.719	38.884 ± 2.105	39.782 ± 2.465
White	145.486 2.187±	145.837 1.952±	153.833 ± 2.992	166.119 ± 3.266	164.891 ± 3.872	26.230 ± 3.794	18.095 ± 0.345	73.613bd ± 1.350	64.216ab ± 0.883	136.391 ± 1.690	40.833 ± 0.956	41.772 ± 1.120
Brown	143.381 3.082±	143.279 2.751±	152.807 ± 4.217	164.259 ± 4.603	164.483 ± 5.457	32.697 ± 5.347	17.992 ± 0.486	74.924bCd ± 1.903	63.093a ± 1.244	135.261 ± 2.381	40.685 ± 1.348	41.777 ± 1.579
Red	146.987 2.986±	147.354 2.629±	158.139 ± 4.030	169.155 ± 4.399	166.595 ± 5.215	36.681 ± 5.110	18.477 ± 0.464	74.181d ± 1.819	66.298b ± 1.189	135.974 ± 2.276	40.505 ± 1.288	41.382 ± 1.509
Over all means	145.434 ±1.963	155.814 ±2.688	155.814 ±2.688	165.354 ±2.932	165.332 ±3.467	30.779 ±3.406	18.144 ±0.310	76.140 ±1.212	64.614 ±0.493	136.223 ±1.517	40.227 ±0.859	41.179 ±1.006

Table-2:The indices of the body measurements % $\pm$ standard errors

	Back line	Chest girth	Body Shape	Body length	Body height
Age					
(years)	abc 50.470	ac 108.279	abcd 104.372	207.786	99.884
1-3	± 1.095	± 2.053	± 2.016	± 4.304	± 0.859
3-5	bcde 50.562	bde 117.909	ab 106.948	212.260	99.127
	± 1.208	± 2.265	± 2.224	± 4.750	± 0.947
5-7	cd 53.584	cbe 112.125	ab 106.560	199.057	100.148
	± 1.545	± 2.898	± 2.845	± 6.075	± 1.212
7-9	de 53.883	dce 114.751	ab 108.394	201.010	99.738
	± 1.519	± 2.847	± 2.796	± 5.969	± 1.191
More than 9 (years)	e 53.555	e 115.821	b 109.780	205.140	100.785
	± 1.482	± 2.778	± 2.728	± 5.825	± 1.162
Sex					
Male	53.502	114.362	107.916	202.139	99.240
	± 1.268	± 2.377	± 2.333	± 4.983	± 0.994
female	51.320	113.193	106.508	207.963	100.233
	± 0.711	± 1.333	± 1.309	± 2.794	± 0.557
Breed					
Al-muanigi	51.768	117.260	106.119	205.843	100.278
	± 1.547	± 2.910	± 2.847	± 6.079	± 1.213
	50.971	113.654	105.901	208.811	100.423
Al-hamadani	± 1.240	± 2.325	± 2.283	± 4.875	± 0.972
	52.980	111.125	106.054	200.280	99.798
Al-Kehailan	± 1.011	± 1.895	± 1.861	± 3.973	± 0.793
	53.925	113.070	110.774	205.269	980.458
Al-	± 1.961	± 3.677	± 3.610	± 7.710	± 1.536

Saqlawi					
	Back line	Chest girth	Body Shape	Body length	Body height
Colour					
Black	ac 56.144 ±2.025	110.968 ±3.797	108.736 ±3.728	ab 192.976 ±7.960	99.369 ±1.588
White	bd 50.685 ±0.920	114.364 ±1.725	105.916 ±1.694	ab 209.543 ±3.617	99.798 ±0.721
Brown	cbd 52.352 ±1.297	114.649 ±2.431	106.550 ±2.387	b 203.241 ±5.097	100.032 ±1.017
Red	d 50.463 ±1.239	115.128 ±2.323	107.646 ±2.281	a 214.443 ±4.871	99.747 ±0.972
The over all means±SE	52.411 ±0.826	113.777 ±1.549	107.212 ±1.521	205.051 ±3.247	99.736 ±0.648

Table-3 :Correlation coefficients among different body measurements of Iraqi Arabian Horses

Body measurment	HW	HC	LB	WB	CA	L3MB	C3MB	LBL	LH	LHL	LA	LHA
HW	-	** 0.907	** 0.735	** 0.717	** 0.543	0.061	** 0.701	** 0.591	** 0.771	** 0.764	0.088	0.150
HC	-	-	** 0.717	** 0.736	** 0.570	0.122	** 0.685	** 0.534	** 0.711	** 0.831	0.074	0.134
LB	-	-	-	** 0.872	** 0.736	0.031	** 0.685	** 0.713	** 0.707	** 0.570	0.075	0.114
WB	-	-	-	-	** 0.888	0.005	** 0.629	** 0.551	** 0.740	** 0.623	-0.097	-0.011
CA	-	-	-	-	-	0.001	** 0.510	** 0.492	** 0.643	** 0.506	-0.078	0.015
L3MB	-	-	-	-	-	-	0.051	0.083	0.117	0.214	-0.106	-0.041
C3MB	-	-	-	-	-	-	-	** 0.594	** 0.725	** 0.618	0.025	0.258
LBL	-	-	-	-	-	-	-	-	** 0.626	** 0.475	0.079	0.120
LH	-	-	-	-	-	-	-	-	-	** 0.594	-0.056	-0.002
LHL	-	-	-	-	-	-	-	-	-	-	-0.025	0.058
LA	-	-	-	-	-	-	-	-	-	-	-	** 0.811
LHA	-	-	-	-	-	-	-	-	-	-	-	-

Discussion:

Oravcova et.al.(2013) have demonstrated that sex has an influence on body conformation of horses. Table (1) explains the overall means of body measurements of local Arabian horses are 145.434 cm for (HW), 145.845(HC),155.814(BL),165.354(CG),165.332(AC),30.779(L3MB),18.144(C3MB), 76.140(LBL),64.614(LH),13.323(LHL),40.227(LA) and 41.179 cm respectively.

Komosa and Purzye (2009) have found similar values for(BL,HC,LA and LHA) in konic and Hucal horses, while Abed El-Rahim(2010) has obtained lowest values for HC(160.088 cm) and higher values for LBL(86.58),BL(132.74), C3MB (17.255), WH(142.493),HC(143.88 cm) respectively and higher values for CG(160.088 cm).

Generally, there are significant ($P < 0.05$) increase in the body measurements with age progress, whereas the horses at 9 years and over have been inquired higher values for all body measurements except LH and LHL measurements as compared with horses at 1-3 years age, these results are similar to the findings of Abed El-Rahim(2010) who has mentioned that mature Syrian Arabian horses have recorded higher measurements as compared with foals.

Oravcova et.al.(2013) have demonstrated that age has the influence on both sexes , mares have recorded arithmetically superiority in all measurements except CA and LBL as compared to stallions. Abed El- Rahim(2010) has showed that males inquired higher values for CG and LBL. Sadek et.al.(2006) has showed that gender is significant source of variation for most body measurements.

Al-Muanigi and Al-Saklawi breeds inquire arithmetic and significant ($P < 0.05$) superiority in most measurements as compared with Al-Hamdani and Al-Kuhailan breeds, similar results for body length, heart girth and wither height measurements in Turkish Arabian foals are demonstrated by Cilek(2012).

Horses colors have no significant effect on body measurements except significant effect ($p < 0.05$) on LBL and LH, whereas the horses with red color have recorded higher values for most measurements than those breeds with other colors.

Table(2) shows that overall means of indices for back line, chest girth, body shape, body length, and body height are 52.411, 113.777, 107.212, 205.051 and 99.736%, respectively.

Abed El-Rahim(2010)has found less values for chest girth, body shape, body length and height indices as 112.077,92.83,154.025 and 99.005%, respectively.

These results explain the value of body height approaches to one, this value refers to the balance between CH and WH. These results agree with those has found by Al-Aboud(2005) in the Egyptian Arabian horses and (Oki, 1989,Biedermann and Schmucker, 1989) in the Thoroughbred and (Miserani et.al., 2002) in the Pantoneiro horses Whereas the indices of body increase with age progress and the Lowest are for horses of(1-3)years age . The highest of horses at ages (7-9) years and 9 years and over, as stallions have achieved superior indices for backline (53.502%), chest girth (114.362%) and body shape (107.916), while mares have inquired superiority in body length, body height (100.233 % and 207.963%) ,respectively. But these differences have no significant and these results agree with those findings of Al-Aboud (2005) in the purebred Arabian horses in Egypt, and Abdel-Rahim (2010) who has obtain 99.005% for body height index.

Evans (2002) explains that (WH) must be higher than (CH) , this result affects the balancing and pacing aesthetics of foot step of horses . These results have reveal that body measurements and their percentages have not been used in breeding in the world. Al- Saklawi breed has been recorded higher indices for back line

(53.925%), (113.070%) for heart girth and (110.774%) for body shape respectively

Al- Munigi breed has been inquired higher indices for body length (208.8%) and (100.42%) for length height. The results of this study show that horses differ in their indices according to their colors, whereas the indices for body length, body shape of black color, body length of white color and body height of brown color are (56.144%), (115.128%), (209.543%) and (100.032%), respectively.

The results show that chest girth index is (113.777%), this value is higher than those demonstrated by (Oki, 1989 and Biederman & Schmucker, 1989) in the Thoroughbred horses and this value is similar to the results mentioned by Abdel-Rahim (2010) who has reported (112.077%) for chest girth for both sexes of mature horses and foals, this refers to the large size of the chest as comparison with body height.

Meadows (2003) and Lawrence (2001) have demonstrated that the chest can be considered as an important part of the body to evaluate physical performance since it consists of the heart, the lungs and represented the respiratory ability and biological activity of the body.

The superiority of Iraqi horses is in the body shape index (107.212%) and body length index (205.051%) which refer to the ability to burden the weight of the horseman for longer distances.

Due to shortness of the back line (76.140 cm) in comparison with the body length (155.814 cm), lowering the applied pressure on the back bone, these pieces of information can explain the superiority of the purebred Iraqi and Arabian horses in races ability, endurance races and races of long distances. The index values for body shape of Iraqi Arabian horses are similar to those results which have been reported by Alagic et al. (2002) in Holstein horses (104.84%) for males and (113.25%) for females, these percentages refer to the

increase in body length as compared with the body height.

The results of the current study for the body shape index is higher than the results which have been obtained by Abdel-Rahim (2010) in Arabian horses whereas (92.83%) as average for mature (males and females) and foals.

The results explained that index of back line and body height are (52.411%), (99.736%), respectively. These results refer to the lowering of the back line index in Iraqi Arabian horses as compared with the high value of the body height and body length, this help to give a very wide step which is very important in the sprints and short distance. These results are in accordance with those found by Biederman & Schmucker (1989) who has reported (0.53) for back line and (1.00) for body height index respectively, and also the current result for back line index is less than that which have been reported by Abdel-Rahim (2010) who has reported (60.53%) for back line index and approach body height index.

Table -3- explains the coefficient correlation among different measurements which are of higher significance of ($p < 0.01$) except the correlation with (LA) and (LHA), are lower and ranged between negative and positive, the correlation between (WH) and (CH) is (0.907). This result is similar to Miserani et al. (2012) who has found the correlation (0.91) in the Pantaneiro horses and Al-Aboud (2005) (0.90) in the Arabian horses in Egypt. While Abdel-Rahim (2010) has found the correlation is (0.82).

The coefficient correlation of this study among WH, CH, BL, CG, C3MB, and LBL ranged from (0.55) to (0.907), these values are higher than those found by Abdel-Rahim (2010) which are ranged between (0.1) to (0.82), moreover similar results have been obtained by Gomez et al. (2009) who mentions that coefficient correlation among different body

measurements are positive significance and range from moderate to low .

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