Biotechnology in Animal Husbandry 23 (1-2), p , 2007 ISSN 1450-9156
Publisher: Institute for Animal Husbandry, Belgrade-Zemun UDC 636.5

THE RELATIONSHIP BETWEEN BODY WEIGHT AND EXTERIOR MEASUREMENTS IN DOMESTIC OSTRICHES DURING THE FIRST FOUR MONTHS AFTER HATCHING**

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** Original scientific paper – originalni naučni rad

Abstract: It is related leg problems to the realization of the necessity of doing a detailed analysis of the phenotype correlations between body weight and exterior measurements. As a result of the study, lower coefficients have been obtaineded of the correlation between the girth of the tarso metatarsus on one hand, and the body weight and the girth behind the wings, on the other hand (respectively 0.563 and 0.608), compared with the one between the body weight and the girth behind the wings (0.898). It is advisable in the selection of ostriches to take into consideration the necessity of a higher phenotypic correlation between the girth of the tarso metatarsus on the one hand, and the body weight and the girth behind the wings on the other hand, with a view to preventing leg problems.

Key words: ostriches, correlations, leg problems

Introduction and literature review

Deformities of the long bones of the legs in ostrich chicks are a widespread problem in world ostrich industry (*Terzich and Vanhooser,* 1993; *Hastings*, 1994; *Gonzales-Trejos*, 1994; *Aarons*, 1995; *Hicks-Alldredge*, 1996; *Du Preez*, 1996; *Jenkins*, 1996; *Cooper*, 2000). The twisted- or rotated-leg syndrome in ostrich chicks is well documented; the greatest incidence of the condition is seen in 4-8-week-old birds (*Bezidenhout et al.*, 1994). A number of researchers relate these problems to the realization of the necessity of doing a detailed analysis of the phenotype correlations between body weight and exterior measurements (*Thornberry* (1989) and *Jobes and Hendrickson* (1993)). Deformities of the long bones have been reported on a number of occasions when the ostriches did not

have any importance for the agricultural industry (*Reece and Butler*, 1984; *Brunning and Dolensek*, 1986; *Guittin*, 1986). Today observations on the practice show that in many cases excessive growth rate associated with overfeeding until four months of age leads to the deformation of the bones and joints of the feet whose development lags in comparison with the accumulation of body mass (*Kistner*, 1994; *Dzama et al.*, 1995; *Doornenbal*, 1995). That is why the restriction of calories and protein in order to maintain a gradual weight gain, and the reduction of food intake when there is any sign of a leg problem, significantly aids the prevention of deformities (*Elfrich*, 1994; *Reiner*, 1995; *Jenkins*, 1996; *Ulrey and Allen*, 1996). According to *Sharp* (1992) there are large differences between the different farms in relation to the problems of the legs in ostriches. *Lambrechts et al.* (1998) accentuate the importance of the correlation between the body mass and the exterior measurements of the ostriches (the girth behind the wings and the girth of the tail being among them). *Mushi et al.* (1998) ascertain that from the hatching to sixteen weeks of age the body weight is highly correlated with the metatarsal length (0.97). *Le Clus* (1997) encloses a scale for forecasting the body mass according to the girth behind the wings (in the original: "diameter of chest" – evidently an inaccuracy) until the age of four months.

The aim of the present study is the determination of the phenotypic correlations between the body weight and the basic exterior measurements as well as between the exterior measurements themselves, in domestic ostriches (*Struthio camelus domesticus*) from the hatching to four months of age – the critical period in the life of an ostrich.

Materials and methods

Investigation was carried out on an ostrich farm in the village of Hairedin, in the Vratsa region, Bulgaria, during the period of June – December 2004, and included two lots of ostriches of the same origin. All the ostrich chicks were marked by means of numbered leg tags. The chicks were kept in mixed groups and raised under identical conditions. The birds were housed until two months of age in premises of measurements 12/2/1.7 m, effectively safeguarded against rodents and small predators, with a yard of measurements 20/20 m, in which there was a shelter of measurements 20/5/2 m; and after that they were housed in premises of measurements 9.2/7.2/2.5 m, with a 56/21 m yard and a 10.2/7.4/3 m shelter. Both premises were equipped with underfloor heating and overhead heat sources as well as with forced ventilation. The walls were of asbestos cement, the floor – concrete, covered for the most part with wood material. During the first month of their life, the ostrich chicks did not at all set foot on the concrete. The floor was initially covered with cotton cloth and after that – with rubber material besides wood. The room temperature was initially 34°C and was

decreased by 0.2°C every day until the age of 45 days, and after that was regulated depending on the climatic conditions and the behaviour of the birds. It was closely watched that the room temperature would not fall below 6°C during sleep. Artificial lighting was turned on all day long, with the exception of the time when the ostriches were taken out for a walk. Access to the yards was given depending on the climatic conditions but at least three times a day for an hour, starting at the age of two weeks. Constant control was maintained of the presence of incidental objects which might be swallowed up by the birds, and the fences were made in such a way and of materials which strongly diminished the probability of traumatic injuries from bumping up against them. Once a day, when the birds were out walking, the premises were cleaned up and disinfected. Feeding consisted of granulated compounded fodder (diameter 4 mm) with cut up lucerne, nettle, pumpkins, beetroot, and carrots added. Drinking water was placed at the disposal of the ostriches, in proportion 3:1 in relation to the granulated fodder, the last pouring of water being done two hours before the final gathering of the birds in the premises. The scheme of the accomplished measuring is presented in Table 1.

Table 1. Obtained measurments in ostriches
Tabela 1. Dobijene mere kod nojeva

	Age (months)/ Uzrast (meseci)	Number of animals/Broj životinja	
		First lot/prva grupa	Second lot/ druga grupa
Body weight/ Telesna masa	0.5	20	24
	1	20	16
	2	14	14
	3	5	8
Exterior measurements (girth behind wings, length of tarsometatarsus, girth of tarsometatarsus, length of beak)/ Eksterijerne mere (obim krila, dužina metatarzusa, obim metatarzusa, dužina kljuna)	0.5	20	24
	1	20	16
	2	14	14
	3	10	8
	4	10	7

Statistical analysis of the results obtained was accomplished by means of Statgraphics Plus Version 7.0 of the Statistical Graphics Corporation (and Manugistics Inc.) (1993).

Results of investigations and discussion

The coefficients of the correlation between the studied traits measured at the same age are presented in Table 2.

Table 2. Coefficients of correlation and corresponding significance levels (in brackets)) between the studied traits measured at the same age (BW – Body weight, GBW – Girth behind wings, LT – Length of tarsometatarsus, GT – Girth of tarsometatarsus, LB – Length of beak)

Tabela 2. Koeficijenti korelacije i odgovarajućih nivoa signifikantnosti, u zagradama, između ispitivanih osobina merenih u istom uzrastu (BW – telesna masa, GBW – obim iza krila, LT – dužina metatarzusa, GT – obim metatarzusa, LB – dužina kljuna)

	Lot	Age (months)				
		0.5	1	2	3	4
BW – GBW	I	0.8707 (0.0042)	0.9748 (0.0000)	0.8990 (0.0006)	0.9290 (0.0000)	–
	II	0.8699 (0.0077)	0.7990 (0.0081)	0.9009 (0.0004)	0.8801 (0.0000)	–
BW – LT	I	0.8177 (0.0088)	0.9559 (0.0000)	0.9349 (0.0011)	0.9009 (0.0093)	–
	II	0.8555 (0.0070)	0.9497 (0.0000)	0.9013 (0.0092)	0.9143 (0.0030)	–
BW – GT	I	0.7010 (0.0909)	0.6409 (0.0401)	0.6039 (0.0557)	0.5019 (0.0709)	–
	II	0.8710 (0.0099)	0.3910 (0.2121)	0.5501 (0.0770)	0.7045 (0.0443)	–
BW – LB	I	0.7707 (0.0071)	0.8008 (0.0003)	0.3294 (0.2029)	0.4749 (0.0987)	–
	II	0.9002 (0.0002)	0.5520 (0.0904)	0.6739 (0.0995)	0.2993 (0.2000)	–
GBW – LT	I	0.6849 (0.1201)	0.6089 (0.0670)	0.8805 (0.0608)	0.8181 (0.0505)	0.6111 (0.0766)
	II	0.7109 (0.0113)	0.6745 (0.0960)	0.7110 (0.0711)	0.8900 (0.0098)	0.5501 (0.0790)
GBW – GT	I	0.9210 (0.0030)	0.2998 (0.0609)	0.7789 (0.0404)	0.6900 (0.0775)	0.8707 (0.0892)
	II	0.9203 (0.0022)	0.6967 (0.0501)	0.6890 (0.0751)	0.6609 (0.0710)	0.7398 (0.0689)
GBW – LB	I	0.7014 (0.0390)	0.5907 (0.1009)	0.5079 (0.1912)	0.4550 (0.0999)	0.5970 (0.0905)
	II	0.5978 (0.0992)	0.3673 (0.2002)	0.4009 (0.1092)	0.4409 (0.1100)	0.6199 (0.0707)
LT – GT	I	0.9169 (0.0007)	0.8489 (0.0071)	0.8703 (0.0060)	0.8388 (0.0096)	0.8318 (0.0190)
	II	0.9202 (0.0005)	0.8690 (0.0069)	0.8476 (0.0098)	0.7978 (0.0178)	0.9009 (0.0089)
LT – LB	I	0.8808 (0.0042)	0.6707 (0.0609)	0.6870 (0.0576)	0.3890 (0.1777)	0.4121 (0.1314)
	II	0.8420 (0.0095)	0.6970 (0.0508)	0.4909 (0.0775)	0.5093 (0.1010)	0.4899 (0.1109)
GT – LB	I	0.6606 (0.0799)	0.2893 (0.2248)	0.3671 (0.1876)	0.4754 (0.1565)	0.5005 (0.1198)
	II	0.7111 (0.0199)	0.3535 (0.2009)	0.3542 (0.1978)	0.4840 (0.1487)	0.4408 (0.1579)

It is worth mentioning that despite the comparatively small number of birds, the majority of the coefficients of the correlation are highly reliable – for instance where the age of fifteen days is concerned, only the result in regard to four out of the twenty possible combinations is doubtful. The lower coefficients of the correlation at the ages of one, two and three months between the girth of the tarsometatarsus on the one hand, and the body weight and the girth behind the wings, on the other hand, compared to the ones between the body weight and the girth behind the wings (weighted averages respectively 0.563 and 0.608 according to 0.898) lead us to the idea of the discrepancy between growth and development of the bone system being the main reason for the leg problems in growing ostriches. Therefore, selection should be directed to the creation of populations characterized also by a higher correlation between the girth of the tarsometatarsus on the one hand and the body weight and the girth behind the wings, on the other hand, and the systems of feeding and breeding of young ostriches should take into consideration the requirements of the harmonious development of the build of the birds, to the detriment of the aspiration for obtaining the highest possible body mass growth.

The typical history is that the eggs have been artificially incubated and the newly hatched chicks fed a high protein diet. This causes rapid growth of the chicks and frequently results, at two to six weeks of age, in the development of various deformities of the legs in ostriches, predominantly of their long bones.

The coefficients of correlation presented in Table 2 confirm a realistic possibility of doing of accomplished by *Le Clus* (1997) exact juxtaposition between the body weight and the girth behind the wings in ostriches.

The phenotypic correlation between the body weight and the length of the tarsometatarsus during the period until the age of three months, ascertained in the present study, is lower than the one obtained by *Mushi et al.* (1998) for the period until 16 weeks of age (the extremely high significance level reached in regard to this correlation at the age of one month should also be taken into consideration).

Conclusion

As a result of the study, lower coefficients have been received of the correlation between the girth of the tarsometatarsus on the one hand, and the body weight and the girth behind the wings, on the other hand (respectively 0.563 and 0.608), compared with the one between the body weight and the girth behind the wings (0.898). It is advisable in the selection of ostriches to take into consideration the necessity of a higher phenotypic correlation between the girth of the tarsometatarsus on the one hand, and the body weight and the girth behind the wings on the other hand, with a view to preventing leg problems.

ODNOS IZMEĐU TELESNE MASE I MERA EKSTERIJERA KOD DOMAĆIH NOJEVA TOKOM PRVA ČETIRI MESECA NAKON IZLEGANJA

A. Kurtenkov

Rezime

Deformiteti dugačkih kostiju nogu kod nojeva pilića su rasprostranjen problem u svetskoj industriji nojeva. Određeni broj istraživanja se odnosi na ovaj problem do realiyacije neophodnosti izrade detaljne analize fenotipskih korelacija između telesne mase i mera eksterijera. Cilj ovog istraživanja je bio određivanje fenotupskih korelacija između telesne mase i osnovnih mera eksterijera kao i među samim eksterijernim merama, kod domaćih nojeva (*Struthio camelus domesticus*) od izleganja do uzrasta od 4 meseca – kritični period u životu noja. Vredno je spomenuti da uprkos komparativno malom broju ptica, većina koeficijenata korelacije je visoko pouzdana – na primer kada se radi o uzrastu od 15 dan, samo rezultat koji se odnosi na četiri od dvadeset mogućih kombinacija je sumnjiv. Niži koeficijenti korelacije u uzrastima od jednog, dva i tri meseca između obima metatarzusa s jedne strane i telesne mase i obima iza krila, s druge, u poređenju sa onima dobijenim između telsne mase i obima iza krila (proseci respektivno između 0.563 i 0.608 prema 0.898) doveli su nas do ideje o diskrepanci između porast i razvoja sistema kostiju kao glavnog razloga za probleme sa nogama kod nojeva u porastu. S toga, selekcija treba da bude usmerena na stvaranje populacija koje se karakteriđu višom korelacijom između obima metatarzusa s jedne strane i telsne mase i obima iza krila, s druge, i sistema ishrane i odgoja mladih nojeva koji bi trebao da uzme u obzir zahteve za harmoničan razvoj građe ptice, na štetu dobijanja najvećeg mogućeg porasta telesne mase.

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