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ANSInet
308 Lasani Town, Sargodha Road, Faisalabad - Pakistan
Mob: +92 300 3008585, Fax: +92 41 8815544
E-mail: editorijps@gmail.com

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The Effect of Cage Stocking Density on Growth, Slaughtering and Carcass Characteristics of Rock Partridges (A. Graeca)

Fikret Esen, Gökçe Özdemir and Orhan Özbey*
Department of Animal Science, Veterinary Faculty, University of Firat, Elazig, Turkey

Abstract: This study was made to determine the effect of cage stocking density on growth, feed consumption and, slaughter and carcass characteristics of rock partridges (A. Graeca). In the study, 135 rock partridge chicks at 4 weeks of age were separated into 3 different placing groups (Two sub groups of 25, two subgroups of 20 and three subgroups of 15 partidges). Group I was gathered in an area of 25 partridges/m^2, Group II in an area of 20 partridges/m^2 and Group III in an area of 15 partridges/m^2. As a result, in Groups I, II and III, partridge weights were found to be 453.06, 446.04 and 444.36 g, feed benefit ratios were 5.84, 6.26 and 6.10; life strength values were 92.00%, 95.00% and 91.11%; carcass output were 72.11%, 72.42% and 73.68%, respectively . The differences between the groups were not statistically significant. Cage stocking density was there fore observed not to have an effect on these parameters.

Key words: Rock partridge, stocking density, growth, carcass

Introduction

Production characteristics in farm animals are formed according to their genetic capacities and environmental factors. Management, feeding and type of housing are especially important among the environmental factors. Type and shape of housing, illumination and stocking density are important factors for poultry. The placement of too many animals per unit area, causes stress and illness which affects the speed of growth and meat quality negatively, while placing few animals causes economical losses. For this reason, animal number per unit area should be well arranged. 8-16 animal/m^2 is recommended for partridges (Cetin, 2000; Kocak and Ozkan, 2000).

Although a significant number of studies have been made regarding the effect of stocking density for chickens, turkeys and quails, limited studies have been conducted for partridges so far (Kirikci *et al*., 1999; Cetin *et al*., 1997; Cetin 2000; Ozcelik *et al*., 1999; Ozek *et al*., 2003; Ozbey and Ekmen, 2000; Nazligul *et al*., 2001; Yazgan *et al*., 1996).

Ogan, 1995, carried out a study to examine 4 different stocking densities (10, 14, 18 and 22 chicks/m^2) and 3 different slaughtering ages (5, 6 and 7 weeks) and found that the live weight values were similar for all slaughtering ages and for 10-14 chicks/m^2 groups.

In a study conducted in bronze turkeys (Sengul *et al*., 2000), at the end of 16 weeks of feeding period in different stocking densities, no differences could be observed between their weights, but a difference was observed between their daily feed consumption.

Nazligul *et al*., 2001; stated that the effect stocking density on feed consumption was not statistically significant.

Altan *et al*., 2002; stated that, by increasing stocking density, feed consumption decreases among genotypes and death ratio increases among some of the genotypes.

A number of studies have proven that increasing stocking density decreases the feed consumption (Altan *et al*., 2002; Anderson *et al*., 1995; Robinson 1979), and the ratio of benefiting from feed (Robinson, 1979; Lee and Moss, 1991; Roush *et al*., 1984), but increases death ratio (Craig and Milliken, 1989; Lowe *et al*., 1964). However no differences could be observed between weight and carcass parameters (Anderson *et al*., 1995; Craig *et al*., 1989).

The purpose of this study was to determine the effect of stocking density on growth, breeding performance, feed consumption, benefiting from feed, life strength and carcass characteristics of rock partridges.

Materials and Methods

Animal material: This study was made in Firat University, Veterinary Faculty Education-Research and Application Farm. 135 rock partridges were used in the study.

In the first 3 weeks, partridges were kept together in the incubator, then their plastic foot numerators were put on and they were separated into 3 different stocking density groups. The groups were placed into separate cages between the 4 and 16 weeks. For this; two subgroups of 25 (Group I), two subgroups of 20 (Group II) and three subgroups of 15 (Group III) partidges were formed.

10 partridges from each group (30 in total) were slaughtered in order to determine the slaughter and carcass characteristics.

Feed material: Chick growing feed that was obtained from a private feed factory was used for nutrition of rock

partridges. The nutrition material ratio of the feed with which the partridges were fed during their growing period, consisted of 92.6% dry material (DM), 20.21% raw protein (RP), 4% raw cellulose (RC), 7% raw ash(RA), 4% raw fat(RF), 58.6% organic material(OM), and 3000 kcal/g metabolic energy (ME). Feed analysis was made by Animal Feeding and Diseases Department Veterinary Faculty at Firat University.

Method: The partridge chicks that were weighed in 4 weeks of age, were separated into 3 density groups (Group I: 25 chicks/m^2), (Group II: 20 chicks / m^2), (Group III: 15 chicks / m^2) and placed into 7 cages with dimensions of 1x1x1 m, including a base platform 15 cm below of each level, manger at the front side and trough at the back side. Medicament was added to their water to prevent them from coccidiosis.

At the end of 16. week, their weight were measured and 10 male chicks from each group, whose weights were close to each other, were slaughtered in laboratory conditions in order to determine slaughter and carcass characteristics. Their blood was spilt, their feathers were plucked, their heads and feet were cut, their organs were taken out and hot carcass weights were measured. Then according to The Institute of Turkish Standards (T.S.E.) scattering technique, the legs, chests, wings, neck and back were cut and carcass piece weights were determined together with skins on them. Also weights of the eatable inner organs (heart, liver, gizzard) were measured. (Anonymous, 1997).

In order to determine the life strength, dead animals were reported daily during the study.

Data collection: One gram sensitive electronic scale was used to measure the weekly weights of animals and feed. Feeding was made regularly every morning. Weights of the residually feed were measured weekly. Weight increases and life strengths were evaluated as individual while feed consumption and feed benefiting values were evaluated as group. Animal weights were measured weekly.

After slaughtering in week 16, the weights of carcass and carcass pieces were measured with 0.1 g. sensitive electronic scale.

Data assessment: SPSS 11.0 package program was used for statistical evaluation of the obtained data. The significance control of the differences of average weights, slaughter and carcass characteristics between the groups were tested by bidirectional variance analysis. Tukey method was used in order to determine the groups which formed the differences. The significance control of differences of life strength between groups were made by Chi Square Test (X^2) (Ozdamar 1999).

Results

Growth: The average weights of the partridges at various periods were given in Table 1. According to the table, although Group I (25 chicks/m^2) had the maximum level of animal weight, no statistically significant difference between were observed between he groups.

Feeding performance values in groups were given in Table 2. It was observed that, at the end of the study (15-16 week) although Group I consumed less feed, their feed benefit values were better within the last week.

The life strength values of the groups were 92.00%, 95.00% and 91.11% for Groups I , II and III , respectively. These differences were not significant (Table 1).

Slaughter and carcass characteristics: The result of slaughter and carcass characteristics were given in Table 3 and their rational calculations were given in Table 4. The average values of Weights of animals were 481.02, 484.81 and 473.40 g; leg weights were 146.13, 145.45 and 146.02 g ($P<0.01$); and wing weights were 32.92, 32.21 and 32.20 g ($P<0.05$) , in Groups I , II and III respectively.

The values for carcass output were 72.11%, 72.42 and 73.68; gizzard ratios were 3.80%, 3.43 and 3.44 ($P<0.05$) in Groups I, II and III respectively (Table 4).

Discussion

Growth: In this study, chicks were randomly selected to form 3 groups. (I. group: 25 chicks / m^2), (II. group: 20 chicks / m^2), (III. Group: 15 chicks / m^2) Animal weights respectively in the beginning were 89.49, 106.89 and 115.50 g. Considering animal weights, maximum weight increase in 16 week was in the I. group where the animal weight is 453.06 g. This difference is considered as statistically not important. This result shows that stocking density does not have an effect on animal weight increase. This result is parallel to some studies. (Sengul *et al.*, 2000; Anderson *et al.*, 1995; Craig and Milliken, 1989).

Feed consumption and benefiting from feed values decrease with increasing density. We can say that density is important on feeding performance. These inventories are also determined by some researchers (Sengul *et al.*, 2000; Nazligul *et al.*,2001; Altan *et al.*, 2002; Anderson *et al.*, 1995; Robinson, 1979; Lee and and Moss, 1991; Roush *et al.*, 1984).

Considering living strength, which is expressed as the ratio of surviving animal quantity to initial animal quantity, no significant difference could be observed between groups which mean that density does not have an important effect on death percentage. These inventories are also parallel to study results of some researchers (Ogan, 1995; Iscan *et al.*, 1995; Ozbey and Ekmen, 2000).

Slaughter and carcass characteristics: When hot carcass weight values of the 3 groups were considered,

Table 1: Weekly Live Weight Averages (g) and Life Strength (%) of Rock Partridges at Various Periods.

Periods (Wks)	Group I				Group II				Group III				F value
	n	$\bar{X}$	$S_{\bar{X}}$	%V	n	$\bar{X}$	$S_{\bar{X}}$	%V	n	$\bar{X}$	$S_{\bar{X}}$	%V	
4th	50	89.49[a]	4.42	34.95	40	106.89[b]	3.77	22.35	45	115.50[bc]	3.44	19.54	8.689**
5th	48	134.48	4.11	21.17	40	137.38	4.58	21.09	45	135.22	4.88	23.67	0.102
6th	48	158.88	4.53	19.75	40	164.82	5.53	21.22	43	168.95	5.78	22.19	0.791
7th	48	207.24	5.5	18.83	40	207.4	5.54	16.91	43	203.09	7.18	22.91	0.371
8th	48	245.04	5.78	16.35	40	244.46	5.86	15.18	43	238.89	7.99	21.67	0.873
9th	47	289.05	7.25	17.08	40	298.39	6.85	14.53	41	278.31	9.36	21.01	2.284
10th	47	320.45	8.2	17.54	40	332.23	6.48	12.34	41	314.44	9.48	18.84	1.83
11th	47	366.78	8.81	16.46	40	372.85	6.11	10.36	41	359.84	9.14	15.87	2.847
12th	47	385.11	8.27	14.73	40	382.82	7.56	12.5	41	382.35	8.78	14.34	0.706
13th	46	418.16[a]	7.99	12.95	40	420.60[ab]	7.77	11.68	41	414.40[c]	8.33	12.56	8.018**
14th	46	432.21	7.93	12.45	40	432.59	7.68	11.23	41	418.22	8.14	12.16	3.182
15th	46	445.72[a]	8.09	12.32	38	439.19[b]	7.73	11.14	41	433.06[bc]	8.21	11.84	3.043*
16th	46	453.06	7.67	11.48	38	446.04	7.5	10.64	41	444.36	8.35	11.7	0.463
	n		Life Strength(%)		n		Life Strength (%)		n		Life Strength (%)		X^2 Value
4th	50		92		40		95		45		91.11		0.494ns
16th	46				38				41				

a,b,c, Differences between the average values marked with different letters on the same lines are significant . (* : P< 0.05, **: P< 0.01) ns : Not significant.

Table 2: Live Weight Gain (LWG) , Feed Benefit Rate (FBR), Additional Feed Consumption (AFC) between 4th and 16th weeks in Rock Partidges

Periods (Weeks)	n	LWG (g)	AFC (g)	FBR	n	LWG (g)	AFC (g)	FBR	n	LWG (g)	AFC (g)	FBR
3-4th	50	28.54	110.15	3.85	40	45.94	107.49	2.33	45	54.58	90.4	1.65
4-5th	48	44.99	229.59	3.12	40	30.49	235.89	3.08	45	19.72	206.9	2.78
5-6th	48	24.4	370.79	3.78	40	27.44	375.89	3.61	43	33.72	334.2	3.09
6-7th	48	48.36	522.27	3.57	40	42.58	531.89	3.63	43	34.14	490.65	3.45
7-8th	48	37.8	682.85	3.7	40	37.06	703.19	3.83	43	35.8	660.29	3.71
8-9th	47	44.01	895.25	3.76	40	53.93	894.85	3.76	41	39.42	841.57	3.87
9-10th	47	30.95	1044.71	4.03	40	33.84	1092.9	4.02	41	36.13	1029.37	4.06
10-11th	47	46.33	1240.29	4.06	40	40.62	1293.3	4.14	41	45.4	1212.57	4.05
11-12th	47	18.33	1434.59	4.43	40	9.97	1499.8	4.65	41	22.51	1406.17	4.37
12-13th	46	33.05	1639.49	4.59	40	37.78	1717.2	4.77	41	32.05	1609.97	4.55
13-14th	46	14.05	1855.84	5	40	11.99	1939.4	5.21	41	3.82	1855.57	5.19
14-15th	46	13.51	2086.56	5.42	38	6.6	2165.4	5.72	41	14.84	2081.37	5.59
15-16th	46	7.34	2291.17	5.84	38	6.85	2413.8	6.26	41	11.3	2339.14	6.1

Table 3: Values (g) Associated With Slaughter and Carcass Characteristics of Rock Partidges

Characteristics	Group I				Group II				Group III				F Value
	n	$\bar{X}$	$S_{\bar{x}}$	%V	n	$\bar{X}$	$S_{\bar{x}}$	%V	n	$\bar{X}$	$S_{\bar{x}}$	%V	
Live weight prior to slaughter	10	481.02	8.6	5.65	10	484.81	7.57	4.94	10	473.4	9.36	6.25	1.457
Warm carcass weight	10	346.59	5.03	4.59	10	352.02	6.16	5.53	10	348.92	7.67	6.95	2.672
Rump weight	10	146.13^{a}	2.71	5.86	10	145.45^{b}	3.51	7.64	10	146.02^{ac}	3.34	7.24	7.742**
Chest weight	10	116.9	3.33	9.03	10	123.76	1.74	4.46	10	121.67	4.67	12.14	0.666
Back-neck weight	10	47.83^{a}	2.45	16.24	10	48.53^{ab}	1.26	8.22	10	50.47^{c}	1.94	12.14	3.252*
Wing weight	10	32.92^{a}	0.93	8.96	10	32.21^{bc}	0.56	5.58	10	32.20^{bc}	0.81	7.95	3.599*
Head weight	10	24.65	0.51	6.57	10	24.7	0.46	5.87	10	24.66	0.61	7.9	2.848
Feet weight	10	11.42	0.26	7.18	10	11.34	0.21	5.9	10	11.34	0.24	6.87	1.391
Heart weight	10	2.57^{a}	0.12	15.17	10	2.93^{b}	0.18	20.13	10	2.49^{ac}	0.2	25.3	4.733**
Liver weight	10	8.47^{a}	0.22	8.14	10	9.49^{b}	0.38	12.75	10	8.01^{ac}	0.27	10.36	5.332**
Gizzard weight	10	13.21^{a}	0.52	12.56	10	12.04^{b}	0.46	12.2	10	12.00^{bc}	0.26	6.5	7.192**

a,b,c, Differences between the average values marked with different letters on the same lines are significant . (* : P< 0.05, **: P< 0.01)

Table 4: Rational Valves (%) Associated With Slaughter and Carcass Characteristics of Rock Partidges

Characteristics	Group I				Group II				Group III				F Value
	n	$\bar{X}$	$S_{\bar{x}}$	%V	n	$\bar{X}$	$S_{\bar{x}}$	%V	n	$\bar{X}$	$S_{\bar{x}}$	%V	
Carcass output	10	72.11	0.75	3.3	10	72.42	0.48	2.12	10	73.68	0.42	1.8	1.149
Rumps ratio	10	42.17^{a}	0.61	4.6	10	41.38^{b}	1.05	8.04	10	41.87^{bc}	0.6	4.58	3.971*
Chest ratio	10	33.77	0.02	9.56	10	35.23	0.68	6.15	10	34.82	0.94	8.55	2.129
Back-neck ratio	10	13.8	0.59	13.55	10	13.81	0.42	9.7	10	14.15	0.69	15.47	0.682
Wings ratio	10	9.50^{a}	0.26	8.84	10	9.18^{b}	0.26	8.93	10	9.24^{bc}	0.23	8.00	12.064**
Feet ratio	10	2.37	0.02	3.79	10	2.33	0.03	4.72	10	2.39	0.03	8.36	0.217
Head ratio	10	5.11	0.06	3.71	10	5.09	0.07	4.32	10	5.2	0.11	7.11	0.562
Heart ratio	10	0.73^{a}	0.03	15.06	10	0.82^{b}	0.04	17.07	10	0.70^{ac}	0.05	22.85	3.537*
Liver ratio	10	2.44^{a}	0.07	9.42	10	2.69^{ab}	0.1	10.81	10	2.30^{c}	0.1	13.91	4.145*
Gizzard ratio	10	3.80^{a}	0.14	11.84	10	3.43b	0.17	15.74	10	3.44^{bc}	0.08	7.26	12.453**

the average values were found to be 346.59, 352.02 and 348.92 g which did not show a significant difference between the groups. Regarding leg weight (which is a valuable piece), Groups I and III were dominant in comparison with Group II (P<0.01), however we can not suggest that density was responsible for this difference.

Considering leg and wing ratios, Group I was dominant which shows the positive effect of density. However regarding carcass output, no significant differences could be observed between the groups. According to these results, it can be said that, density has an effect on some of the carcass characteristics but generally does not have a significant effect on slaughter and carcass characteristics. These results were also supported by other studies (Sengul *et al*., 2000; Anderson *et al*., 1995; Craig and Milliken, 1989).

In conclusion, cage stocking density of rock partridges was observed not have a significant effect on the parameters examined in the current study (except on leg and wing ratios in carcass) and partridges can be comfortably grown in 25 chick/m^2 cage area and this density may be more economical.

References

Altan, A., O. Altan, S. Ozkan, K. Ozkan, Y. Akbas ve and V. Ayhan, 2002. Yuksek Yaz Sicakliklarinda Kafes Yerlesim Sikliginin Yumurta Tavuklarinin Performansi Uzerine Etkileri. Turk. J. Vet. Anim. Sci., 26: 695-700.

Anderson, K.E., G.B. Havenstein and J. Brake, 1995. Effects of Strain and Rearing Dietary Regimenson Brown-Egg Pulled Growt and Strain, Rearing Dietary egimens, Density and Feeder Space Effects on Subsequent Laying Performance. Pout. Sci., 74: 1079-1092.

Anonymous, 1997. Turk Standartlari-Tavuk Govde Eti Parcalama Kurallari. T.S.E. TS/Kasim. ANKARA

Cetin, O., K. Kirikci and N. Gulsen, 1997. Farkli Bakim Sartlarinda Kinali Kekliklerin (A. Chukar) Bazi Verim Ozellikleri. Vet. Bil. Derg., 13: 5-10.

Cetin, O. and K. Kirikçi, 2000. Keklik Yetistiriciligi. Alternatif Kanatli Yetistiriciligi. Selcuk Uni Vakif Yayinlari. 93-107, KONYA.

Cetin, O., 2000. Kaya Kekliklerinin (A. Graeca) Farkll Kesim Yaslarinda Buyume, Besi Performansi, Kesim ve Karkas Ozellikleri. Tavukculuk Aras Derg., 2: 41-44.

Craig, J.V. and G.A. Milliken, 1989. Farther Studies of Density and Group Size Effects in Caged Hens of Stocks Differing in Fearful Behavior, Productivity and Behavior. Poult. Sci., 68: 9-16.

Iscan, K.M., M.E. Tekin and S. Inal, 1995. Yumurta Tavuklarinda Kafeslerde Farkli Yerlesim Sikliginda Performanslari. Hay. Aras. Derg. KONYA.

Kirikci, K., C. Tepeli, O. Cetin, A. Gunlu and A. Yilmaz, 1999. Farkli Barindirma ve Aydinlatma Sartlarinda Kaya Kekliklerinin (A. Graeca) Bazi Verim Ozellikleri. Vet. Bil. Derg., 15: 15-22.

Koçak, C. ve and S. Ozkan, 2000. Bildircin, Sulun ve Keklik Yetistiriciligi (I. Basim). Keklik Yetistiriciligi, Ege Unv. Ziraat Fak. Yayinlari No: 538, 56-64. IZMIR.

Lee, K. and C.W. Moss, 1991. Cage Density and Layer Performance. Poult. Sci., 70(Suppl.1), 71(Abstr.).

Lowe, R.W. and B.W. Haywang, 1964. Performance of Single and Multiple Caged White Leghorn Layess. Poult. Sci., 43: 801-805.

Nazligul, A., H.E. Bardakcioglu, K. Turkyilmaz, N Cenan ve and D. Oral, 2001. Japon Bildircinlarinda Yerlesim Sikliginin Yumurta Verimi, Yumurta Agirligi ve Yem Tüketimine Etkisi. Istanbul Unv. Vet. Fak. Derg., 27: 429-438.

Ogan, M., 1995. Broiler Uretiminde Degisik Yerlesim Sikligi ve Kesim Yaslarinda Buyume ve Ekonomik Verimlilik. Uludag Unv. Vet. Fak. Derg., 14: 19-29.

Ozbey, O. ve and F. Ekmen, 2000. Japon Bildircinlarinda Mevsim ve Yerlesim Sikliklarinin Buyume, Yasama Gucu ve Karkas Uzerine Etkileri. Y.Y.U. Vet. Fak. Derg., 11: 28-33.

Ozcelik, M., Z. Erisir and A. Esen, 1999. Japon Bildircinlarinda Yerlesim Sikliginin Canli Agirlik Artisi, Kesim ve Karkas Ozelliklerine Etkileri. Veteriner Hek. Dernegi Derg., 1-2: 46-54.

Ozdamar, K., 1999. SSPS ile Biyoistatistik. Kaan Kitabevi. 3. Baski. ESKISEHIR.

Ozek, K., O. Yazgan and Y. Bahtiyar, 2003. Effect of Dietary Protein and Energy Concentrations on Performance and Carcase Characteristics of Chukar Partridge (A. Chukar) Raised in Captivity. Br. Poult. Sci., 44: 419-426.

Robinson, D., 1979. Effects of Cage Shave, Colony Size, Floor Area and Cannibalism Preventatives on Laying Performance. Br. Poult. Sci., 20: 345-356.

Roush, W.B., M.M. Mashaly and H.B. Graves, 1984. Effect of Increased Bird Population in a Fixed Cage Area on Production and Economic Responce of Single Comb White Leghorn Laying Hens. Poult. Sci., 63: 43-48.

Sengul, T., A. Yildiz ve and Y. Konca, 2000. Farkli Yerlesim Sikliginin Bronz Hindilerin Besi Performansý ve Karkas Ozellikleri Uzerine Etkisi. Tavukculuk Aras. Derg. 2: 33-39.

Yazgan, O., S. Boztepe, A. Ozturk, S.S. Parlat ve and B. Dag, 1996. Japon Bildircinlarinda (Coturnix Coturnix Japonica) Farkli Yerlesim Sikligi ve Aydinlatma Programlarinin Besi Performansi ve Cinsel Olgunluk Yasina Etkileri. TR. J. Vet. Anim. Sci., 20: 261-265.