FORCE MOLTING IN FAYOUMI AND DANDARAWI COCKS AND ITS EFFECT ON SEMEN CHARACTERISTICS

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Abstract

This study was carried out at farm of faculty of Agriculture, Assiut University to study the effect of force molting on semen characteristics of Fayoumi and Dandarawi males at 44 and 57 weeks of age. The total number used was 80 cocks (40 from each strain). The cocks were force molted by feed restriction method following Washington program. The results obtained led to the following conclusions :

1- The force molting resulted in an increase in semen volume, sperm concentration, motility and semen pH.

2- Inducing molt at 57 weeks was more effective in the improvement of semen quality than at 44 weeks of age.

3- The Dandarawi cocks were more responsive for force molting than the Fayoumi.

4- It is possible to improve semen quality by inducing molt at 57 weeks of age.

INTRODUCTION

Limited information are known about the relationship between force molting and semen characteristics (Woodard *et. al.*, 1975; Nestore *et. al.*, 1979 and Jacquet *et al.*, 1993).

It is known that the fertility declines markedly pronounced cocks after about 45-50 weeks of age, such decline causes a great loss in hatching eggs especially in parents and grand parent stocks. (De Reviers, 1986).

Moreover, such relationship was not studied in the local strains under Upper Egypt conditions.

Therefore, it is of a great importance to study the effect of force molting on semen quality of Dandarawi and Fayoumi flocks raised under such environment.

MATERIALS AND METHODS

This study was carried out at Animal and poultry production departement, Faculty of Agriculture, Assiut University, to study the effect of force molting on semen characteristics of the Fayoumi and Dandarawi males at 44 and 57 weeks of age.

The total number used was 80 cocks in two ages. In the first age, 40 cocks (20 from each of Fayoumi and Dandarawi) were force molted at 44 weeks of age, while, in the second age, the force molting was done at 57 weeks of age using an equal number of cocks. Cocks of each strain in each age were divided in two groups, one of these was force molted by feed restriction method following Washington program (Table 1), while, the second group was kept as a control. All cocks were raised in batteries under conventional conditions and fed on a diet containing 14 % crude protein and 2750 K. cal/kg diet (Table 2). Semen samples were collected weekly by the massage method from all birds to determine their semen characteristics.

The semen characteristics studied were, semen volume, sperm concentration, sperm motility and hydrogen ion concentration (pH).

All data were analyzed by using international computer program. All models of the statistical analysis were done according to Snedecor and Cochran (1981).

RESULTS AND DISCUSSION

1- Semen volume : Means of semen volume as affected by the age at force molting and strain are presented in Table 3.

Inducing molting at 44 weeks of age was associated with a decrease in semen volume by about 0.15 ml (43 %), 0.21 ml (68 %), 0.20ml (71 %) and 0.20 ml (80 %) at 1,3,5 and 7 weeks (during force molting program), respectively in the Fayoumi, and 0.15ml (43 %) , 0.18ml (56 %), 0.20 ml (67 %) and 0.20 ml (74 %) at the same intervals, respectively, in the Dandarawi as compared with their controls.

However, at 9,11 and 13 weeks (after the end of force molting program), semen volume began to increase by about 0.02 ml (7 %), 0.11 ml (49 %) and 0.19 ml (95 %), respectively, in the Fayoumi, and 0.06 ml (21 %), 0.13 (52 %) and 0.18 ml (78 %), in the Dandarawi, respectively, as compared with their controls.

Inducing molt at 57 weeks of age was associated with a decrease in semen

volume by about 0.07 ml (32 %), 0.09 ml (43 %), 0.08ml (44 %) and 0.07 ml (47 %) at 1,3,5 and 7 weeks (during force molting program), in the Fayoumi, and 0.09 ml (33 %), 0.11 ml (46 %) and 0.10 ml (50 %), at the same intervals in the Dandarawi, respectively, as compared with their controls. However, at 9,11 and 13 weeks (after the end of force molting program), semen volume began to increase by about 0.16 ml (94 %), 0.22 ml (157 %) and 0.25 ml (156 percent), respectively in the Fayoumi, and 0.19 ml (106 %), 0.23 ml (143 %) and 0.27 ml (159 %) at the same intervals, respectively, in the Dandarawi as compared with their controls.

From the above results, it could be concluded that, inducing molt at 44 and 57 weeks of age led to a decrease in semen volume for 7 weeks during force molting program, after which it increased to the end of experimental period.

The increase in semen volume at 9,11 and 13 weeks of treatment was more pronounced when the molt was induced at 57 weeks than at 44 weeks of age.

This indicated that, inducing molt at 57 weeks of age caused more improvement in the semen volume than when it was induced at 44 weeks of age. The Dandarawi gave higher semen volume than the Fayoumi after molt.

These results were in agreement with those reported by Parker and Mcspdden (1943) on Rhode Island Red cockerels, Kryeger (1978) on white Turkey breeder males and Hafez (1968) on the adult male chickens.

The decrease in semen volume during force molting may be due to the reduction in feed consumption and loss in body weight. However, the increase in the semen volume after molting may be due to the effect of physiological rest and increase in feed consumption and, hence, body weight.

Analysis of variance (Table 7) shows that the differences in semen volume due to treatment, strain, period and their interactions were significant. Esa (1997) found significant positive correlation between Fertility and semen volume of the cocks of the same strains.

2- Semen concentration: Generally, sperm concentration per ejaculate was considered important for fertility (Jaquet. *et. al.*, 1993). Several other factors such as level of nutrition may affect sperm concentration and, subsequently, the reproductive performance of the cock.

Means of sperm concentration as affected by the age at force molting and strain are presented in Table 4.

Inducing molt at 44 weeks of age was associated with a decrease in sperm concentration by about 1.7 mils / mm^3 (57 %), 2.21 mils/mm^3 (77 %), 2.34 mils/

mm^3 (84 %) and 2.44 mils/mm^3 (92 %) at 1,3,5 and 7 weeks of force molting program, in the Fayoumi, and 2.15 mils/mm^3 (59 %), 2.66 mils/ mm^3 (78 %) , 2.68 mils/mm^3 (82 %) and 2.89 mils/mm^3 (91 percent), in the Dandarawi, respectively, as compared with their controls. However, at 11 and 13 weeks of treatment, sperm concentration increased by about 0.12 mils/mm^3 (45 %) and 0.62 mils/mm^3 (24 %), in the Fayoumi, and 0.15 mils/mm^3 (5 %) and 0.72 mils/ mm^3 (25 %), in the Dandarawi, respectively, as compared with their controls.

The same was true when the molt was induced at 57 weeks of age. But the decreases were about 1.03 mils/mm^3 (39 %), 1.84 mils/mm^3 (73 %), 1.86 mils/ mm^3 (79 %) and 2.06 mils/mm^3 (90 %) at 1,3,5 and 7 weeks of treatment, in the Fayoumi, and 0.85 mils/mm^3 (31 %), 1.81 mils/mm^3 (70 %), 1.75 mils/mm^3 (72 %) and 2.07 mils/mm^3 (87 %) at the same intervals, in the Dandarawi, respectively, as compared with their controls. However, at 11 and 13 weeks of treatment semen concentration increased by about 0.64 mils/mm^3 (28 %) and 1.14 mils/mm^3 (52 %), in the Fayoumi, and 0.75 mils/mm^3 (33 %) and 1.41 mils/ mm^3 (62 %), in the Dandarawi, respectively, as compared with their controls. In general, the sperm concentration decreased by force molting to reach its minimum at the 7 th week of molting program and, then, started to increase to the end of experimental period.

The increase in semen concentration after the end of molting program was more pronounced when the molt was induced at 57 weeks of age rather than at 44 weeks of age.

These results are in agreement with those reported by Parker and Mcspadden (1943), woodard *et. al.* (1975), Nestore *et. al.* (1979) and Jaquet *et al.* (1993). After molt induction, it was found that testosterone and Luteinizing hormone concentrations in plasma increased and activated the pituitary testicular axis and hence increased sperm production (Jaquet *et. al.* 1993). The increase in sperm production was associated with the increase in feed consumption and the recovery of body weight loss. During different ages, the Dandarawi showed higher sperm concentration than the Fayoumi. Such differences can be explained through the differences in reproductive capacity of the two strains. Analysis of variance, (Table 7) shows that the differences in semen concentration due to treatment, strain, period and their interactions were significant. Esa, (1997) found significant positive correlation between sperm concentration and Fertility.

3- Sperm motility: Motility was considered as one of the best evidence of semen viability. The effect of age at force molting on sperm motility are presented in Table 5.

Inducing molt at 44 weeks of age decreased sperm motility by about 38,45,52 and 60 percent at 1,3,5 and 7 weeks of treatment (during force molting program) in the Fayoumi, and 30,45,57 and 60 % in the Dandarawi, respectively, as compared with their controls. However, at 9,11 and 13 weeks of treatment (after force molting program), it increased by about 3,7 and 12 % in the Fayoumi as compared with 5,5 and 5 %, respectively, in the Dandarawi.

The same trend was observed when molt was induced at 57 weeks of age. The decrease in sperm motility was 20, 31,39 and 42 % at 1,3,5 and 7 weeks of treatment (during the force molting program) in the Fayoumi, and 14,20,36 and 38 % in the Dandarawi, respectively. At 9,11 and 13 weeks of treatment (after force molting program), sperm motility increased by about 13,20 and 20 % in the Fayoumi, and 16,21 and 23 % in the Dandarawi, respectively, as compared with their controls.

This means that inducing molt at 44 and 57 weeks of age caused a decrease in sperm motility after molting program (to 7 weeks) may be due the effect of feed restriction.

However, after the end of molting program, sperm motility started to increase, but this increase was more pronounced when molt was induced at 57 weeks rather than at 44 weeks of age.

Table 5 shows that the rate of motility of treated groups reached nearly the same level as that before treatment at about 9 weeks in the groups molted at 57 weeks of age, while, it had not yet reached such level until 13 weeks in the group molted at 44 weeks of age. Also Dandarawi recorded higher sperm motility than Fayoumi. These results are in agreement with those reported by Wilson and Harms (1972) and Woodared *et. al.* (1979)., who showed that the breeds differ in sperm motility.

Analysis of variance (Table 7) shows that the differences in sperm motility due to treatment, strain, period and their interactions were significant.

4- Semen pH : semen pH was an important measurement for semen evaluation since it reflects its quality. The results of the effect of force molting on semen pH are presented in Table 6. Inducing molt at 44 weeks of age caused a decrease in semen pH till 7 weeks of treatment by about 0.50, 0.30, 0.30 and 0.40 units at 1,3,5 and 7 weeks of treatment in the Fayoumi, and 0.40, 0.40, 0.60 and 0.50 units at the same intervals in the Dandarawi, respectively, as compared with their controls. However, at 9,11 and 13 weeks of the experiment it increased by about 0.40, 1.20 and 1.40 units in the Fayoumi, and 0.10,0.60 and 0.90 units in the Dandarawi, respectively, as compared with their controls.

The same trend was noticed when molt was induced at 57 weeks of age, but the decreases were .50, 0.30, 0.40 and 0.40 units in the Fayoumi, and 0.20, 0.10,0.30 and 0.30 units in the Dandarawi at 1,3,5 and 7 weeks of treatment (during force molting program), respectively, as compared with their controls. However, it increased by about 1.00,1.30 and 1.70 units in the Fayoumi, and 1.20,1.40 and 1.70 units in the Dandarawi at 9,11 and 13 weeks of the experimental period, respectively, as compared with their controls.

From the above results it could be concluded that, during force molting program, semen pH decreased, while, it increased after the end of force molting program. This increase was more pronounced when molt was induced at 57 weeks rather than at 44 weeks of age. These results are in agreement with those reported by Hafez (1968) and Sturkie (1976) .

Analysis of variance (Table 7) shows that the differences in semen pH due to treatment,strain,period and strain x period were significant.

Esa (1997) found that there were positive significant correlations between fertility and pH (+ 0.55).

It could be concluded from this study the possibility of using the force molting as a means to improve semen characteristics of genetically valiable cocks of local strains when they are progressing in age.

Table 1. Washington force molting program.

Day	Feed	Water	Light
1	No change	No change	8 hrs
2	Not available	Not available	8 hrs
3	Not available	Not available	8 hrs
4	Not available	Not available	8 hrs
5 - 4 9	27 g/cock	Available	8 hrs
50	retuen full feed	Available	14-16 hrs

Table 2. The composition and chemical analysis of experimental ration.

Ingredient %		Chemical analysis %	
Yellow corn	70.00	Protein	14.00
Soy bean meal 44%	4.00	Calcium	1.20
Concentrate	10.00	Total phosphorus	0.80
Salt	0.30	Lysine	0.56
Wheat bran	14.50	Methionine	0.26
Limestone	1.20	M.E	2750k.cal/kg ration

Table 3. Means of semen volume (ml) as affected by the age at force molting and strain.

Time Treat	at 44 wk's				at 57 wk's			
	Control		Treated		Control		Treated	
	F	D	F	D	F	D	F	D
Before treat.	0.30	0.36	0.33	0.38	0.20	0.24	0.23	0.27
After treat.								
1 st wk	0.33	0.35	0.18	0.20	0.22	0.27	0.15	0.18
3 rd wk	0.31	0.32	0.10	0.14	0.21	0.24	0.12	0.15
5 th wk	0.28	0.30	0.08	0.10	0.18	0.22	0.10	0.12
7 th wk	0.25	0.27	0.05	0.07	0.15	0.20	0.08	0.10
9 th wk	0.28	0.29	0.30	0.35	0.17	0.18	0.33	0.37
11 th wk	0.23	0.25	0.34	0.38	0.14	0.16	0.36	0.39
13 th wk	0.20	0.23	0.39	0.41	0.16	0.17	0.41	0.44

F : Fayoumi D = Dandarawi

Table 4. Means of sperm concentration (mils/mm^3) as affected by the age at force molting and strain.

Time / Treat	at 44 wk's				at 57 wk's			
	Control		Treated		Control		Treated	
	F	D	F	D	F	D	F	D
Before treat.	3.10	3.75	3.25	3.90	2.60	2.80	2.56	2.65
After treat.								
1 st wk	3.00	3.62	1.30	1.47	2.66	2.71	1.63	1.86
3 rd wk	2.86	3.40	0.65	0.74	2.52	2.60	0.68	0.79
5 th wk	2.80	3.26	0.46	0.58	2.36	2.42	0.50	0.67
7 th wk	2.64	3.16	0.20	0.27	2.30	2.37	0.24	0.30
9 th wk	2.60	3.00	1.74	2.18	2.32	2.34	1.96	2.28
11 th wk	2.65	2.89	2.77	3.04	2.26	2.30	2.90	3.05
13 th wk	2.54	2.84	3.16	3.56	2.20	2.26	2.34	3.67

Table 5. Means of sperm motility (%) as affected by the age at force molting and strain.

Time / Treat	at 44 wk's				at 57 wk's			
	Control		Treated		Control		Treated	
	F	D	F	D	F	D	F	D
	90	97	95	96	80	85	83	87
After treat.								
1 st wk	88	95	50	65	80	84	60	70
3 rd wk	85	95	40	50	76	80	45	60
5 th wk	82	92	30	35	74	76	35	40
7 th wk	80	90	20	30	72	73	30	35
9 th wk	80	85	83	90	72	76	85	82
11 th wk	78	85	85	90	70	74	90	95
13 th wk	75	87	87	92	70	72	90	95

Table 6. Means of semen pH as affected by the age at force molting and strain.

Time / Treat	at 44 wk's				at 57 wk's			
	Control		Treated		Control		Treated	
	F	D	F	D	F	D	F	D
Before treat.	7.5	7.7	7.3	7.6	6.8	7.0	6.6	7.1
After treat.								
1 st wk	7.5	7.7	7.0	7.3	6.8	7.0	6.3	6.8
3 rd wk	7.3	7.5	7.0	7.1	6.5	6.8	6.2	6.7
5 th wk	7.0	7.4	6.7	6.8	6.5	6.8	6.1	6.5
7 th wk	6.8	7.1	6.4	6.6	69.4	6.6	6.0	6.3
9 th wk	6.6	7.0	7.0	7.1	6.2	6.2	7.2	7.4
11 th wk	6.3	7.0	7.5	7.6	6.2	6.3	7.5	7.7
13 th wk	6.1	6.8	7.5	7.7	6.0	6.1	7.7	7.8

Table 7. Analysis of variance of the effect of age at force molting and strain on semen characteristics of Fayoumi and Dandarawi males.

S-V	D.F	M. S values			
		Volume	Concentration	Motility	PH
Treat. (T)	3	0.073**	25.87**	7058.73**	6.497**
Strain (S)	1	0.142**	4.998**	3025.80**	4.632**
Period (P)	7	0.10**	15.200**	6889.15**	1.602**
TXS	3	0.0007*	0.568*	99.26*	0.165
TXP	2	0.0004*	5.883*	2602.15**	2.209
SXP	7	0.0818**	0.060**	44.48**	0.032**

* Significant at (<0.05)

** Significant at (<0.01)

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القلش الاجبارى فى ديوك الفيومى والدندراوى وتأثيره على صفات السائل المنوى

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أجريت هذه الدراسة فى مزرعة الدواجن بكلية الزراعة جامعة أسيوط وذلك لدراسة تأثير القلش الاجبارى على صفات السائل المنوى لذكور الفيومى والدندراوى وأجريت على مرحلتين : الأولى عند عمر ٤٤ أسبوعاً واستخدم فيها ٤٠ من الديوك (٢٠ من كل من الدندراوى والفيومى) والثانية عند عمر ٥٧ أسبوعاً واستخدم فيها نفس العدد السابق . وقد قسمت الطيور المستخدمة فى كل عمر إلى مجموعتين أحداهما ضابطة والثانية أجريت لها قلش اجبارى بطريقة تحديد الغذاء (برنامج واشنجتون) وقد وضعت الديوك فى ظروف متماثلة وقد أخذت عينات سائل منوى قبل المعاملة وبعد بداية البرنامج بـ ١، ٣، ٥، ٧، ٩، ١١، ١٣ أسبوعاً تم تقدير حجم القذفة، وتركيز الحيوانات المنوية فى المليميتر المكعب والحركة ودرجة الحموضة الـpH وكانت النتائج المتحصل عليها كالآتي:

١ . كان القلش الاجبارى عند عمر ٥٧ أسبوعاً أفضل من عمر ٤٤ أسبوعاً .

٢ . كانت ذكور الدندراوى أكثر استجابة للقلش الاجبارى من ذكور الفيومى فى تحسين الصفات المدروسة .

٣ . من نتائج الدراسة يتضح امكانية استخدام القلش الاجبارى كوسيلة لتحسين صفات السائل المنوى فى السلالات المحلية خاصة عند عمر ٥٧ أسبوعاً .