



C, *ad libi*, F, 8, 9, 1, F, 1996; *e al.* 2002), (8, 9, 1, F, 1990; *e al.* 2012) (ADF). Egg C (*e al.* 2007; *e al.* 2012). F, A, C, C, (EC), EC, F, A, 49, 16, 12, (*ad libi*), B, 10, (958 × g), 80 C, 36, A, 360, B, 20, 40, F, E, 2250<sup>2</sup> (45 × 50), A, 200 g, 20 C, EC, (C), A, AC (2002), (D), C, 105 C, 5, (1). C, 21, 27 C, 16 / (F, C), 550 C, 24, C, 10, 20, D, C

**MATERIAL AND METHOD**

**Experiment 1**  
 A 360 g B 20 g 40 g ( / g ) ( / ) E 2250<sup>2</sup> (45 × 50) A 200 g 20 C EC (C), A AC (2002). (D) C 105 C 5, (1). C 21 27 C 16 / (F, C) 550 C 24 C 10 20 D C

**Table 1** Ingredients and nutrient composition of experimental dietst

(%)	C	6% C	6% EC	8% EC	10% EC
C	65.75	66.30	66.30	66.50	66.75
(44.2% C)	20.89	12.84	12.84	10.02	7.19
F (60.2% C)	2.70	4.20	4.20	4.80	5.40
C		6.00			
E			6.00	8.00	10.00
	8.66	8.66	8.66	8.68	8.66
	0.30	0.26	0.26	0.25	0.23
C	0.72	0.50	0.50	0.42	0.37
D	0.14	0.13	0.13	0.12	0.12
	0.34	0.61	0.61	0.71	0.78
	0.50	0.50	0.50	0.50	0.50
E ( / g)	2,690	2,680	2,680	2,678	2,676
C,	16.01	16.03	16.03	16.05	16.04
C,	3.62	3.52	3.55	3.49	3.58
	0.67	0.71	0.68	0.73	0.76
	0.83	0.81	0.81	0.81	0.80
	0.41	0.41	0.41	0.40	0.41
+ C	0.65	0.65	0.65	0.65	0.65

g . C, ; E, g ; , ; C, ; C, 60 g C 60, 80 100 g EC  
 1.5 g: B<sub>2</sub>, 4 g; B<sub>6</sub>, 2 g; B<sub>12</sub>, 0.02 g; A, 7000 ; D<sub>3</sub>, 2500 ; E, 30 ; 3, 1 g; B<sub>1</sub>,  
 0.16 g: F, D, C (2009). , 400 g; C, 10 g; F, 70 g; , 100 g; , 70 g; , 0.4 g; , 0.5 g.

g e al. (2004).  
 (A C 2009). F  
 -8900 A A A ( C:  
 A C (2009). Egg  
 (DE -6000; C . , , ).  
 80 C. A  
 A C (2009).

(A A) F  
 16.0 ( C g , (A). D  
 0.05 ± E.

**E L AND DI C ION**

( 2)  
 C -  
 68% F C -  
 C ( 1.24 g/ g 0.40 g/ g),

**Table 2** Nutrient composition and contents of free gossypol of cottonseed meal and expanded cottonseed meal†

(% )	C	EC
D	91.20	91.02
EE	0.63	0.57
C	43.99	43.87
A	6.63	6.50
CF	5.97	5.74
C	0.27	0.26
	1.04	1.08
F , g/ g	1.24	0.40

A ; CF ;  
 C , ; C , ; D , ; EC ,  
 ; EE, ; F , g

F  
 C (C g &  
 B 1981).  
 e al. (2001 ) C  
 F  
 C  
 EC  
 ( ) A  
 ADF  
 3, C EC  
 ADF 10% EC (P < 0.05) ADF  
 (P < 0.05) B 8% EC  
 6% C 6% C  
 (FC ) (P < 0.05)  
 C  
 ( e al. 1993; A &  
 2005). e al. (2001 )  
 C  
 C (1994)  
 g 6% C (F : 75.12 g/ g)  
 EC  
 FC  
 C  
 A  
 g EC 8% EC  
 FC EC  
 Egg g EC

**Table 3** Average feed intake, laying rate, average egg weight and feed conversion of laying hen†

	C	6% C	6% EC	8% EC	10% EC
ADF (g)	119.72 ± 1.78	123.57 ± 1.26	122.00 ± 2.20	123.81 ± 0.52	124.95 ± 1.06
g (%)	95.71 ± 1.08	92.96 ± 1.08	94.03 ± 0.60	96.47 ± 0.36	95.52 ± 1.23
A g g g (g)	57.92 ± 0.89	54.91 ± 0.97	56.53 ± 0.46	57.74 ± 0.36	57.17 ± 0.88
FC (g:g)	2.07 ± 0.06	2.25 ± 0.06	2.16 ± 0.04	2.14 ± 0.02	2.19 ± 0.05

(P < 0.05). D 18 g  
 / ADF, g ; C , ; EC , ; FC ,

Table 4 Egg quality of laying henst

		C	6% C	6% EC	8% EC	10% EC
A	g ( )	6.66 ± 0.54	5.40 ± 0.85	6.81 ± 0.43	6.15 ± 0.51	5.42 ± 0.86
	g	83.05 ± 1.75	73.42 ± 1.75	82.97 ± 2.41	77.96 ± 3.67	74.09 ± 2.36
		5.90 ± 0.43	7.19 ± 0.19	6.75 ± 0.41	6.60 ± 0.30	6.89 ± 0.35
Egg	g ( g / <sup>2</sup> )	3.98 ± 0.28	3.50 ± 0.88	3.48 ± 0.69	4.38 ± 0.44	4.24 ± 0.30
Egg	( )	0.372 ± 0.012	0.388 ± 0.031	0.393 ± 0.027	0.385 ± 0.043	0.406 ± 0.034

C ; EC ; (P < 0.05). D

Egg

(P > 0.05)

6% C 10% EC (P < 0.05)

6% 8% EC 15% 60% C (D e al. 2002; e al. 2007).

C (D e al. 2002).

6% C (P < 0.05)

C 30% C (D e al. 2002).

e al. 1989; ( e al. 1991).

Egg (D e al. 2002).

F

(F<sup>+</sup>) e al. 1966).

e al. (2007)

(4).

A 5, 6% C F F EC F (P < 0.05). (P > 0.05) C F e al. (2001) EC g g ( e al. 2005). 6% C F (P < 0.05) EC F (P < 0.05) F 6% C 10% EC (P < 0.05) F A e al. (1996) e al. (1995) e al. (2001) 6% C (P < 0.05) F 10% EC (P < 0.05) EC (P < 0.05) F 6% C 10% EC (P < 0.05) F (E 1996).



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