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EFFECT OF GINGER AND CELERY SEEDS AS FEED ADDITIVES ON REPRODUCTIVE PERFORMANCE OF BROILER BREEDER MALES

Zaed J. M. Saed*, Th. T. Mohammed and S. M. Farhan

Department of Animal Production, College of Agriculture, University of Anbar, Anbar, Iraq.

Abstract

The present study was part of project designed to assess the effect of induction of graduate ginger and crushed celery seeds in treatment diet on reproduction performance. In previous work were evaluated how these nutrients affect the egg quality in a particular internal egg quality. The aim of the present study was to assess the effect of basal diet supplementation with 2.5 and 5 g/kg diet of each ginger and crushed seeds of celery on semen quality, testes histology, fertility and hatchability of broiler breeder males was evaluated.

In experiment 1, broiler breeder males were individually caged from 24 to 38 weeks old and divided into five group, 6 males per group, semen was collected twice weekly. T1 control group treated with basal diet, T2 and T3 ginger groups treated birds (ginger 2.5 and 5 g/ kg basal diet), T4 and T5 celery seeds groups treated birds (2.5 and 5 g/ kg basal diet). Experiment 2, laying hens 600 and 60 rosters (ROSS) were housed in 20 floor pen, from 26 to 38 weeks of age were divided into five treatment groups with four replicate (30 hens + 3 rosters) and were natural mating and received as in experiment one. Eggs collected from each replicate eggs for each replicate at end weeks 32 and 36 weeks of age. Rate of fertility and hatchability was evaluated.

Semen variables were evaluated, testes histology were measured, and hatchability each 4 weeks were recorded.

Semen volume, sperm concentration, number of sperm per ejaculate, motility and viability were affected by ginger and crushed celery seeds supplementation. Testes histology fertility and hatchability and displayed a positive trend in treatment groups fertility was better in ginger and celery crushed seeds than control group. It was concluded that the inclusion 2.5 and 5 g/kg diet. Ginger or crused celery seeds could be improve reproductive performance of broiler breeder males.

Key words : Broiler breeder, semen, ginger, celery, fertility.

Introduction

One of the biggest problem associated with the developments of modern commercial broiler breeder flocks has been often decrease in fertility from many reasons related to these genetic improvement may be accompanied by decline in broiler breeder reproductive variables, Such as delayed sexual maturity and reduced fertility that have been generally with excess body weight and other factor such as the process of formation of sperm.

However, other evidence has suggested that vitamin E and its role in avian reproduction in egg and in embryonic tissues in sperm membranes were widely reviewed by Surai (1999) and many experiment have been carried out on the dietary effect of vitamin E supplementation considering its antioxidant properties (Lin *et al*., 2004, 2005; Cerolini *et al*., 2005; Jedlinska-Krakowska *et al*., 2006; Cerolini *et al*., 2006; Castellini *et al*., 2007; Hooda *et al*., 2007). It has also been demonstrated that the oxidative stress cause sperm damage with speed up he access of phenomenon of programmed death germ cell leading to decline in number of sperm (Shalaby and Zorba, 2010).

Research interest has focused various herbs that posse antioxidant properties that may reduced the risk of free radicals (Nagano *et al*., 1997; Pendry *et al*., 2005; Popović *et al*., 2006). The presence of flavonoid and other phenolic antioxidant has been reported in a number of herbs, e.g. the ginger (Sekiwa *et al*., 2000; Zancan *et al*., 2002) and in celery (Momin and Nair, 2002; Popović *et al*., 2006). The majority of flavones, flavonols and

Author for correspondence : E-mail: ag.zaid.jameel@uoanbar.edu.iq

flavanones were present as gluronides as glucoside and most of these studies determined as glycones.

The potential of ginger in medical fields is based on the chemistry of volatile oil and non-volatile oil, which is about 2-3% and consists of 64% sesquiter-pene, hydrocarbons, 6% carbonyl compounds, 5% alcohols, monoterpene hydrocarbons and 1% esters. The principal minerals and vitamins of gingers in mg/ 100g are Ca, 20: P, 60 and Fe, 2.6; the vitamins, thiamine, 0.06; riboflavin, 0.03; niacin, 0.6 and ascorbic acid 6.0. Although, ginger has proven anti-inflammatory. Antioxidant and anti-cancer properties (Kim *et al*., 2005; Shuka and Singh, 2006; Stoilova *et al*., 2007; Wijekoon *et al*., 2011 b; Lachumy *et al*., 2010).

However, Wijekoon *et al*. (2011a) was analyzed to identify its nutritional and anti-nutritional contents, and found that ginger had significant amount of crude protein (12.6%), fat (18.2%) and fiber content (17.6%), fatty acid profile was composed with high level of unsaturated fatty acids (palmitoleic acid 16.4%, linoleic acid 14.5%, oleic acid 5.2%). The amino acid profiles revealed the presence of essential amino acids dominated by leucine and lysine (7.2 and 7.9 mg/100mg protein, respectively). The inflorescence contained major minerals like: K (1589 mg/100g), Ca (775 mg/100g), Mg (327 mg/100g), P (286 mg/100 g) and S (167 mg/100 g). The levels of antinutrients analyzed were 3496 and 2851 mg/ 100g for saponin and phytic acid, respectively. The heavy metals analyzed (Cd, As, Pb, Hg, Ni) were below detection limits.

Celery contain 2.5-3% volatile oil primarily containing 60- 70% d-limonene and 10- 20% β- selinene. Essential seed oil is available however, the most common extractive from is the olelesin, due to its fuller flavor. This product contain 12- 16% volatile oil (Wolski *et al*., 2001). A sesquiterpen either, kessane (2.2-7.6)% was also detected (Philippe *et al*., 2002).

This work has been undertaken to investigate the effect of ginger and celery levels in the ration on semen production. testes histology, fertility and hatchability of broiler breeder males.

Materials and Methods

The present studies was carried out the poultry station, State Board of Agriculture Research, Ministry of Agriculture, during the period from 1 December 2013 to 30 April 2014 to investigate the effect of adding different levels of ginger and cursed seed of celery on reproductive performance of broiler breeder males.

In the first experiment

Thirty broiler breeder, ROSS 308 GP 24 weeks old were caged (34 × 46 × 60) cm in a standard controlled environment (22ºC). Each cages had one nipples per cage to provide *ad libitum* access water. The birds were fed with standared commercial diet for breeders. 11.5 MJME/ kg, crude protein 15.5 g/ kg, CF 37 g/ kg, Methionine 3.9 g/ kg, Lysine 7.1 g/ kg, Ca. 28 g/ kg, P 3.5 g/ kg, Na 1.6 g/ kg, K 7.5 g/kg, Cu 10 mg/ kg, Fe 60 mg/ kg, Mn 60 mg/ kg, Zn 100 mg/ kg, Se 0.20 mg/ kg according to the ROSS broiler breeder management guide 145 g/day.

The health and reproductive status of the males were assessed and only healthy males were selected for the experiment.

The cockerels were assigned at random to the 5 treatment with 6 males each (6 replicate each). Treatment 1 (control group) no addition, while, treatment, 2 and 3 were given an cruch *Z. officinate* at 2.5 and 5 g/ kg diet and treatment 4 and 5 were given an cruch seed of *Apium grveolens* at 2.5 and 5 g/kg diet respectively (table 2). Males were ejaculated twice weekly using the abdominal massage method (Gee and Temple, 1978; Lake and Stewart, 1978; Zhang, 2006).

Plant material

The ginger and celery seeds was collected from local market in Baghdad.

The ginger used from analysis were fresh maturity with uniform colour, using Wijekoon *et al*. (2011a) method preparing the powdered samples and stored at 4 C° until further analysis. The ginger powdered was analyzed to preparing its nutritional and anti-nutritional contents using similar methods that used by Wijekoon *et al*. (2011a). The ginger powder had, crude protein (12.01) g, lipid (17.3) g, fiber (16.2) g fatty acid profile was composed with hish level of unsaturated fatty acids (palmitoleic acid 15.6%, linoleic acid 12.5%, oleic acid 6.3%) and ash (16.3)g.

The celery seed was crushed and analyzed to identify its contains using ASTA (1977) methods. The crushed seed had protein (17.6 g) fat (22.1) g ash (10.6 g), vitamin A. activity (RE) 5.

The standard hemcytometer and light field microscope (Olympus Corp. Tokyo, Japan) were used to determine sperm concentration, motile sperm at a magnification of 400×. To measure the ratio of dead and abnormal spermatozoa, the smears of fresh semen were made on microscope sliders After preservation in 95% alcohol for l min and staining with 0.05% nigrosin/ eosin (N/E) solution for 3 min. (Bakst and Cecil, 1997), 200 spermatozoa per smear were checked under the inter-light filed Olympus microscope at the magnificent of

1000×. Video playing was also used to check the dead and abnormal sperm. The JVC microscope-video system and parnasonic monitor (Vietor Co. Japan). Sperm motility was evaluated subjectively by a phase contrast microscope (20 ×) at room temperature (n= 3 replicate observations): 10 ml of extender semen were placed on a Makler chamber, a counting chamber specifically designed for semen analysis and recorded as percentage of motile cells per total observed cells. And viability was expressed as percentage of live cells per total number of counted spermatozoa (Bakst and Cecil, 1997). Relative volume (R.V%), diameter (TD) and length of the seminiferous tubules (TL) were determined (Aire *et al*., 1980). In the second experiment, six hundred hens and 60 males, 24 weeks old from ROSS strain were housed in 20 floor pens with four replicates (30 hens + 3 roster) each pen and fed ad libitum a diet of 16.1% crude Protein and 2869 kcal ME/kg (table 1) water was supplied by automatic waters.

The treatments as follows: T1 (control) no addition T2 and T3 included addition of 2.5 and 5 g/ kg crushed ginger, which contain respectively, T4 and T5 included addition of 2.5 and 5 g/ kg crushed seed of celery, respectively. The diet were mixed every 2 week and were randomly feed hens in 4 replicates fed 160 g/ bird day (table 2) and water were provided *ad libitum*. The experiment were fed for of 16 week production period. For fertility and hatchability studies 30- 40 eggs as possible from each replicate were collected over three consecutive days at the end week 32 and 36 week of age. Experimental eggs were stored at 10- 12 ºC and relative humidity of 55- 60% and incubated on the third day of collection following standard hatchery practices. There for eggs seemed infertile and an hatched eggs were broken out to determine fertility (F) fertile hatch ability (FH) was expressed as percentage (%).

Statistical comparison were made using ANOVA test comparison of data in the control group and the experimental groups. The results were expressed as mean±SEM (standard error of means) significant differences is written in parentheses. When the difference were significant Duncan's multiple range test was performed (Duncan, 1955). Mean values were considered significantly different ($p<0.05$).

Results

Semen traits

Semen volume collected during 26- 38 weeks of age from the experimental males is given in table 2. The average semen volume per ejaculate was found to be 0.468, 0.571, 0.609, 0.582 and 0.629 for T1, T2, T3, T4, and T5 groups, respectively. The analysis of variation indicated a significant difference ($p<0.05$) between treatment groups in semen production capacities. The lowest ejaculate volume were collected from T1 group and the largest volume were collected from the males in T3 and T5 groups ($p<0.05$). Intermediate volume were obtained from T2 and T4 groups. Although, there was no significant difference between treated males with ginger or crushed celery seeds in semen volume, a significant differences ($p<0.05$) were found among the experiment males (table 2).

Table 1 : Diet formation and compassions.

Ingredient %	Formula
Yellow corn	52
Wheat milding	14
Breed con-5 (40% p)	5
Soybean (44% p)	18.09
Sunflower oil	2.56
Dicalcium phosphate	1.44
Limestone	6.82
Salt	0.09
Total	100%
ME (Kcal/ kg)	2870
Crud protein %	16.12

*Breed con-5 Special W, concentrate for poultry feed Infusion 5% in feed for percentage Specifications: crud protein 40%, crude fat 5.0, crude fiber 2.0, calcium 8.0, phosphorous (avail) 4, lysine 3.75%, methionine 2.85, methionine +cys 3.20, methionine+ energy 2100, sodium 2.20 and phytase added.

No significant differences in percentage or dead and abnormal spermatozoa in the semen produced by different treatment males ($p>0.05$) due to the dietary ginger or crushed celery seeds were observed.

Average motility percent for males fed with different diets was 67.8, 80.9, 81, 82.2 and 86.1% and the average of viability percent was 76.4, 81, 82.5, 80.2 and 82.2 for T1, T2, T3, T4 and T5 males groups, respectively. Analysis of variances showed significant different between control group and other treatment, but there were no significant difference between other treatments in this respect.

Final body weight 4.72, 4.80, 4.74, 4.77, and 4.69 kg for T1, T2, T3, T4, T4 and T5, respectively.

No differences in the final body weight of males that could be attributed to adding ginger or crushed celery seeds levels were apparent at termination of the experimental periods (24- 36 weeks of age) shown in table 3.

Table 2 : Effect of datary ginger and creshed seeds of celery on semen traits of broiler breeder males (ROSS) during 38 weeks of age.

Semen traits	T1 control	Diets treatments			
		Ginger g/ kg		Celery seed g/ kg	
		T2 (2.5)	T3 (5)	T4 (2.5)	T5 (5)
SV (ml)	$0.468^{B}\pm0.018$	$0.571^{A}\pm0.018$	$0.606^{A}\pm0.019$	$0.583^{A}\pm0.016$	$0.629^{A}\pm0.020$
SC ($10\times^{9}$)	$04.931^{B}\pm0.434$	$5.021^{B}\pm0.360$	$5.026^{B}\pm0.364$	$4.930^{B}\pm0310$	$5.229^{A}\pm0.332$
NSE ($10\times^{9}$)	$2.307^{B}\pm0.200$	$2.867^{A}\pm0.194$	$3.046^{A}\pm0.214$	$2.857^{A}\pm0.164$	$3.289^{A}\pm0.201$
DSP%	$12.2^{A}\pm0.49$	$11^{B}\pm0.61$	$11.6^{C}\pm0.52$	$10.9^{B}\pm0.47$	$10.7^{C}\pm0.52$
ANSP%	$12.9^{A}\pm0.27$	$12.7^{B}\pm0.25$	$11.5^{C}\pm0.17$	$10.9^{B}\pm0.18$	$10.8^{B}\pm0.26$
M%	$78.80^{C}\pm0.62$	$80.92^{A}\pm0.94$	$84.03^{A}\pm0.93$	$82.55^{B}\pm1.27$	$86.01^{B}\pm0.8$
Viability	$76.4^{C}\pm1.03$	$86.63^{A}\pm0.72$	$81.55^{A}\pm1.21$	$78.31^{B}\pm1.46$	$79.31^{B}\pm0.8$

1= Each observation is the average of 40- 48 measurement of traits of 6 male.

*= Data represented on mean±SE in the same row with different supersite and significantly different $p<0.05$ (compere with control group)

SV (ml)= semen volume, SC= sperm concentration, NSE= number of sperm per ejaculate, DSP%= dead sperm, ANSP= abnormal sperm, M%= motility.

Table 3 : Testes histological traits of broiler breeder males fed different level of ginger and crushed celery seeds at 36 weeks of age (N=6).

Testes Traits	T1 control	Diets treatments			
		Ginger g/ kg diet		Celery seed g/ kg diet	
		T2 (2.5)	T3 (5)	T4 (2.5)	T5 (5)
Testes weight (g)	$25.289^{B}\pm6.535$	$26.922^{B}\pm7.298$	$28.609^{A}\pm7.504$	$26.604^{B}\pm6.511$	$26.890^{B}\pm7.873$
RV (%)	87.50±2.45	89.62±2.56	87.96±5	88.41±1.15	87.60±2.39
TD (μ)	$228.11^{B}\pm23.58$	$244.98^{B}\pm22.05$	$250.12^{A}\pm23.08$	$231.11^{B}\pm23.58$	$240.65^{B}\pm22.60$
TL (m)	$321.19^{B}\pm29.14$	$333.09^{B}\pm30.24$	$348.29^{A}\pm10.71$	$324.38^{B}\pm12.71$	$323.58^{B}\pm11.35$
Body weight (g)	4.71±0.27	4.80±0.31	4.74±0.31	4.69±0.35	4.74±0.47

1= Each observation is the average of 30 measurement of traits of 6 male.

*= Data represented on mean±SE in the same row with different supersite and significantly different $p<0.05$ (compere with control group)

RV%= Relative proportion of seminiferous tubules%, TD= Diameter seminiferous tubules (μ), TL= Tubular length (m), body weight (g).

Feeding control diet resulted in lower testicular weight at 36 weeks of age, while significantly heavier ($p<0.05$) testicular weights were observed in males fed 5 g/kg diet crushed ginger. The average testicular weights were 25.28, 26.92, 28.61, 26.60 and 26.89 g for T1, T2, T3, T4 and T5 respectively. The difference between T1 (control group) and T2, T4 and T5 groups was not significant ($p>0.05$).

There were no significant differences between treatment groups in the relative proportion of seminiferous tubules per unit testicular volume nor in diameter or length of seminiferous tubules. However, they were noticeably higher in the males receiving the ginger or crushed celery seeds ($p>0.05$).

Fertility and hatchability

Fertility of eggs resulting from natural mating with males receiving different treatment diets determined over two convective periods (32 and 36 weeks of age) averaged 85, 87, 90 and 87% for T1, T2, T3, T4 and T5 respectively shown in table 4. The average fertility % was superior for the males fed 5 g/kg diet ginger compared to the control groups ($p<0.05$).

Although no similarity was noted between other treatment and control groups ($p>0.05$).

The average hatchability of fertile eggs was 94, 95, 96, 96 and 96% and average hatchability of total eggs was 80, 83, 87, 83 and 84% for T1, T2, T3, T4 and T5% groups, respectively. The average hatchability of total eggs which reflects the combined measurement (fertility

Table 4 : Fertility and hatchability and hatch from fertile eggs of broiler breeder chickens fed experimental diets

Age	Verb	T1	T2	T3	T4	T5
32	F%	85.13±1.7	86.98±2.15	90.72±1.64	86.98±2.46	87.33±1.98
36		85.90±2.3	87.33±1.47	90.13±1.92	87.24±2.0	88.15±2.13
Average μ AV		85.51±2.1^{B}	87.15±2.25^{AB}	90.42±2.13^{A}	87.06±2.11^{AB}	87.74±1.74^{AB}
32	H%	79.72±2.7	82.20±1.82	86.81±2.50	82.75±1.35	83.33±2.71
36		81.87±2.27	84±1.94	88.15±1.42	84.56±2.31	85.52±1.64
μ		80.79±1.96^{B}	83.10±1.76^{AB}	87.48±1.68^{A}	83.65±2.05^{AB}	84.42±1.89^{AB}
32	H from F%	93.65±2.01	94.48±2.31	95.42±2.33	95.23±1.81	95.41±1.64
36		95.31±1.90	96.18±1.85	97.81±2.17	96.92±2.03	97.01±1.92
μ		94.48±????	95.33±2.35	96.61±2.14	96.07±1.78	96.21±2.18

*= Data represented on mean±SE in the same column with different supersite are significantly different $p<0.05$ (compare with control group).

and hatchability) was always lower ($p<0.05$) in control group and the results seemed to suggest that the 5 g/ kg diet ginger was slightly superior.

Discussion

The composition of ginger and celery seeds was similar to the values presented by (Zachariah, 2008; Krishnamurthy, 2008; Wijekoon *et al*., 2011a). The present study demonstrated that the inclusion of graded concentration of each ginger and crushed celery seeds (2.5 or 5 g/kg diet) in broiler breeder males diets significantly improve reproductive performance, even though all diets were is-nitrogenous and is-caloric. These finding could be due to the presence of (volatile oil 2-3% and oil consists of 64% sesquiterpene, 6% carbonyl compounds, 5% alcohols, 2% monotrpene hydrocarbons and 1% esters, the main compound are zingberene 29.5% and sesquiphellandrene 18% in the ginger that interfere with antioxidant property as indicated by Jorsaraei *et al*. (2008), Wijekoon *et al*. (2011a). These authors also found that ginger act as antioxidant when adding at 0.1, 0.2, 0.4 and 0.6% resulted in decrease the dead spermatozoa percentage during semen storage. Also in particular, adding ginger 100 mg/kg life body weight to the dietary of wistar rats was shown to increase spermatozoa motility, testosterone concentration and improve semen traits (Khaki *et al*., 2009). Ginger extract has been reported to have antioxidant property of gingerol related compounds, and diarylheptanoids from common ginger (Nakatani, 2003). Studies by Stoilova *et al*. (2007) established that ginger extract inhibited hydroxyl radicals by 79.6% at 37°C and 74.8%, which showed a higher antioxidant activity than quercetin. Seaid *et al*. (2011) studied the effect of ginger extract (5 and 10%) in drinking water on reproductive performance of broiler breeder males and found that most values of semen parameters were higher in treated males than control group. In our previous refeeding experiment high values of fertility and hatchability percent were found in broiler breeder chickens refed 2.5 or 5 g/ kg ginger than control group (Zaed, 2012).

Regarding the effect of crushed celery seeds on reproductive performance of broiler breeder males were found that the birds reefed 2.5 or 5 g/kg diet has most values of semen trait and fertility, hatchability percentage, testes histological parameters and lowest value of dead and abnormal spermatozoa percentage in treated males than those control group and were found to behave in the same manner as far as ginger is concerned.

In this work, the increase values of reproductive parameters of broiler breeder males was probably due to the components of celery seeds. The composition of the oil from seeds (Limonens) (50.1- 65.5%) and β-selinene (11.2- 22.2%) were major components in the seeds oil of celery. A sesquilerpene, ether, kessane (2.2-7.6%) was also detected (Philppe *et al*., 2002). The phenolic compounds. Particularly the phenolic (flavones) may be responsible in the part for the antioxidant activity of traditional plant extracts including celery (Pendry *et al*., 2005; Cseke *et al*., 2006; Kolarovic *et al*., 2010). Celery seeds are also nutrive. The major composition of seed is carbohydrate, followed by fat, protein and ash. They also contain micronutrients (Ca, P, Na, K and Fe) and vitamins (A, C, Thiamin, Ribflavin, Nacin). Although the induction of antioxidant activity by celery seeds has been reported (Momin and Nair, 2002; Han *et al*., 2004; Fachriya *et al*., 2007; Shalaby and Zorba, 2010). Results obtained in this experiment also tend to be in particle agreement with the findings of Zaed (2012), who reported

higher fertility and hatchability values were found in broiler breeder males reefed ginger or celery seeds at 2.5 or 5 g/kg diet. In this study for evaluation of reproductive performance, it is important to note that study showing a tendency for improved reproductive performance when broiler breeder males are supplemented with 5 g/ kg diet of ginger or crushed celery seeds.

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