

Effect of dietary parsley (*Petroselinium crispum*) supplementation on semen quality of local Iraqi ganders

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Abstract

This study was carried out to investigate the effect of dietary supplementation with different levels of parsley on semen quality of local Iraqi ganders. A total of thirty two local ganders were used in this study during the period from beginning of February to the end of April. The ganders were allocated for 4 treatment groups containing 8 ganders each. Treatment groups were as follows: Control diet (free from parsley), T1: Control diet + 80 g/d parsley, T2: Control diet + 160 g/d parsley; T3: Control diet + 240 g/d parsley. Semen samples were collected twice a week fortnightly from each gander by dorsal-abdominal massage method. First semen collection was used to evaluate semen volume, sperm concentration, live in total sperm, live and normal morphology sperm, semen quality factor, sperm motility, abnormal sperm, acrosomal abnormalities, spermatocrit and pH of semen. However, the second semen collection was used for determine seminal plasma concentrations of glucose, protein, cholesterol & activities of aspartate aminotransferase (AST), alanine aminotransferase (ALT) and alkaline phosphatase (ALP) enzymes. Results revealed that feeding diets containing different levels of parsley (T1, T2, and T3) resulted in significant ($P<0.05$) increase in semen volume, sperm concentration, live and normal morphology sperm, semen quality factor, sperm motility, spermatocrit and seminal plasma activity of ALP enzyme and significant ($P< 0.05$) decrease in abnormal sperm and acrosomal abnormalities and seminal plasma concentrations of glucose, protein, and cholesterol and seminal plasma activities of AST and ALT enzymes as compared with control group. There was no significant difference in pH of semen among the control and experimental groups (C, T1, T2, and T3). In conclusion, dietary supplementation with different levels of parsley especially at the level of 240 g/d (T3) caused significant improvement with relation to semen traits. So, parsley can be used as an effective tool for improve semen quality of ganders.

Key words: Parsley, Semen Quality, Ganders

Introduction

The medicinal plants and herbs have been used in the treatment of various diseases in animals and human beings. Now-a-days utilization of these medicinal plants is increasing. These are used in animal feed as the growth promoters and for enhancement of productive performance (Chairs, 2000). The practice of herbal medicine dates back to the very earliest period of known human history. There is evidence of herbs having been used in the treatment of diseases and for revitalising body system in almost all ancient civilization, the Babylonian, the Egyptian, the Chinese and even Greek and Roman civilization (Aftab and Sial, 1999). Majority of herbal plants are safe and economical. Generally, plant extracts have no problem of drug resistance (Tipu et al., 2006).

Parsley is the powerhouse of nutrients containing high levels of beta, carotene, vitamin B12, folate,

chlorophyll, calcium, more vitamin C than citrus fruits and just about all other known nutrients. Parsley enhances and stimulates the energy of organs, improving their ability to assimilate and utilize nutrients. Parsley is a source of elpha-linolenic acid, an important essential fatty acid for growth and reproduction (Bardley, 1992). Richmond and Mackley (2000) reported that parsley is rich in minerals such as calcium, potassium, iron and vitamins such like A, C, thiamin, riboflavin and niacin. Abaas (2010) found that the supplementation of broiler chicks diets with 3g/kg parsley seeds improved productive performance. Osman et al. (2004) reported that replacing soy been meal by parsley cakes up to 15% had no deleterious effects on feed consumption of broilers during the whole growth period. Bahnas et al. (2009) indicated that adding dried leaves of parsley to the quail diet at levels of 0.25% and 0.5% had no significant effect on live body weight, body weight gain, growth rate, feed conversion and performance index during the period

from 10 to 38 days of age. Since, there was no study conducted regarding the role of parsley in enhancing reproductive performance of birds. So, the objective of the present experiment was to investigate the impact of dietary supplementation with different levels of parsley (as fresh leaves) on semen quality of local ganders.

Materials and Methods

Two years old local ganders (N= 32) were used in this study. The birds involved in this study were housed in 4 separated floor pens under an artificial lighting program of 12L: 12 D from the beginning of February to the end of April. Pools of water were made available to ganders. For 3 months of experiment all ganders were fed 200 to 250 g/day, a commercial ration for goose breeding which containing 12 MJ metabolisable energy and 17% crude protein. Parsley was offered in the form of fresh leaves. The ganders separated into 4 treatment groups containing 8 ganders each. Treatment groups were as following:

Control diet (free from parsley; Control)

T1: Control diet + 80 g/day parsley

T2: Control diet + 160 g/day parsley

T3: Control diet + 240 g/day parsley

Samples of semen were collected twice a week fortnightly from each gander by using dorsal-abdominal massage procedure (Al-Daraji, 2007a) by the same two persons into a single layer glass artificial vagina (Fig 1 & 2). First, semen collection was used to evaluate semen volume, sperm concentration, live in total sperm, live and normal sperm morphology, semen quality factor, sperm motility, abnormal sperm, acrosomal abnormalities, spermatocrit and pH of semen by using the methods reported by Al-Daraji (2007b). However, the second semen collection was used after pooled the semen from 4 ganders in each treatment group to

determine seminal plasma concentrations of glucose, protein, cholesterol and activities of aspartate aminotransferase (AST), alanineamino transferase (ALT) and alkaline phosphatase (ALP) enzymes by using the procedures indicated by Al-Daraji (2007b). The data was assessed by analysis of variance using the General Linear Model method (SAS, 2000). Test of significance for the difference between different treatments was done by Duncan's multiple range test (Duncan, 1955).

Results

Results of this experiment indicated that the supplementation of the ganders ration with parsley (T1, T2, and T3) resulted in significant ($P<0.05$) increase in semen volume, live in total sperm, live and normal morphology sperm, semen quality factor, sperm motility, and spermatocrit and significant ($P<0.05$) decrease in abnormal sperm and acrosomal abnormalities as compared with control group (C), while there was no significant differences among treatment groups with relation to pH of semen (Table 1). Furthermore, there were no significant differences between T1 and T2 concerning sperm concentration, live in total sperm, acrosomal abnormalities and spermatocrit (Table 1). As shown in Table 2 supplementing ration of ganders with parsley (T1, T2, and T3) caused significant ($P<0.05$) decrease in seminal plasma concentrations of glucose, protein, cholesterol and activities of AST and ALT enzymes and significant ($P<0.05$) increase in seminal plasma activity of ALP (alkaline phosphatase) enzyme in comparison with control group. Moreover, it is also clear from table 2 that there was no significant difference between T1 and T2 with respect to seminal plasma concentrations of glucose and protein and activities of AST, ALT, and ALP enzymes.

Table1: Effect of dietary supplementation with different levels of parsley on semen traits (Mean±SE) of local ganders

Traits	Treatments			
	C	T1	T2	T3
Semen volume (ml)	0.19 ± 0.03 ^c	0.32 ± 0.02 ^b	0.37 ± 0.01 ^a	0.45 ± 0.02 ^a
Sperm concentration (×10 ⁶ / ml)	635 ± 75.3 ^c	803 ± 61.6 ^b	842 ± 81.2 ^b	991 ± 83.6 ^a
Live in total sperm (%)	68.3 ± 7.6 ^c	75.1 ± 4.9 ^b	77.0 ± 8.5 ^b	85.2 ± 6.9 ^a
Live and normal morphology perm (%)	51.9 ± 4.8 ^c	63.7 ± 6.0 ^b	66.2 ± 7.5 ^b	70.1 ± 7.9 ^a
Semen quality factor	62.61 ± 11.1 ^d	163.68 ± 22.7 ^c	206.23 ± 31.6 ^b	312.61 ± 40.5 ^a
Sperm motility (%)	55.9 ± 3.2 ^c	63.8 ± 4.9 ^b	65.2 ± 6.7 ^b	78.1 ± 8.8 ^a
Abnormal sperm (%)	44.2 ± 3.9 ^a	36.9 ± 1.8 ^b	34.7 ± 4.5 ^b	25.0 ± 2.6 ^c
Acrosomal abnormalities (%)	13.9 ± 1.2 ^a	9.2 ± 0.95 ^b	8.9 ± 0.78 ^b	6.5 ± 0.80 ^c
Spermatocrit (%)	6.2 ± 0.95 ^c	7.9 ± 0.80 ^b	8.1 ± 0.79 ^b	9.5 ± 0.97 ^a
pH	7.02 ± 0.93	7.08 ± 0.88	7.06 ± 0.75	7.05 ± 0.63

Each value represented the mean of 6 semen evaluations; C: Control group; T1, T2, and T3: Diet supplemented with 80, 160, and 240 g/day of parsley; ^{a-c} Values within rows followed by different letters differ significantly ($P<0.05$).

Table2: Effect of dietary supplementation with different levels of parsley on seminal plasma traits (Mean±SE) of local ganders

Traits	Treatments			
	C	T1	T2	T3
Glucose (mg/100 ml)	69.5 ± 5.3 ^a	52.3 ± 5.9 ^b	49.9 ± 2.9 ^b	33.7 ± 3.8 ^c
Protein (g/100 ml)	0.87 ± 0.09 ^a	0.75 ± 0.06 ^b	0.71 ± 0.04 ^b	0.59 ± 0.05 ^c
AST (Unit/litre)	85.3 ± 4.6 ^a	73.7 ± 5.8 ^b	71.6 ± 3.2 ^b	60.9 ± 6.9 ^c
ALT (Unit/litre)	6.1 ± 0.95 ^a	5.0 ± 0.88 ^b	4.8 ± 0.91 ^b	2.5 ± 0.54 ^c
ALP (King Armstrong Unit)	55.7 ± 3.6 ^c	69.2 ± 6.5 ^b	71.8 ± 8.9 ^b	80.9 ± 9.2 ^a
Cholesterol (µg/ml)	0.91 ± 0.05 ^a	0.78 ± 0.03 ^b	0.70 ± 0.06 ^c	0.61 ± 0.04 ^d

Each value represented the mean of 6 semen evaluations; C: Control group; T1, T2, and T3: Diet supplemented with 80, 160, and 240 g/day of parsley; ^{a-c}Values within rows followed by different letters differ significantly (P<0.05).

**Fig. 1: Phallus erection in response of dorsal-abdominal massage of gander****Fig. 2: Semen collection from gander**

Discussion

The improvement in semen quality traits due to treatment the local ganders with parsley in traits of semen and seminal plasma may be explained by the

supplementation of parsley plant which is rich source of vitamins, minerals, chlorophyll, essential fatty acids, and volatile oil components (Duke, 1997). Wichtl (1994) reported that parsley stimulates sexual activity in both men and women, stimulates the sensory nerves, and increases sexual wish. However, parsley may increase sexual activity through several mechanisms such as increase testosterone and other sexual hormones production and increase energy supply for reproductive organs. Al-Daraji (2002) found significant positive correlation between spermatozoa motility, spermatozoa concentration and spermatocrit.

Moreover, Al-Daraji (2001a) noticed significant positive correlation between percentages of dead and abnormal spermatozoa. Al-Daraji (2001b) concluded that the highly significant negative correlation between numbers of spermatozoa and glucose concentration in seminal plasma suggests the utilization of glucose by spermatozoa. Al-Daraji (2002) indicated that spermatozoa utilize the glucose in their metabolism.

As shown in the results of this study T1, T2, and T3 groups exhibited significantly lower concentration of seminal plasma protein (Tables 2). Thurston (1976) showed that the number of abnormal germinal cells and spermophages present in turkey semen increases as the seminal plasma protein concentration increased. Thus, the reduction in reproductive performance may be due to increased numbers of abnormal spermatozoa and spermatids in semen with high seminal plasma protein which is in agreement with our study. Thurston et al. (1992) indicated that the level of seminal plasma protein can be used as a predictor of fertility and hatchability due to its significant negative correlation between seminal plasma protein concentration and fertility, hatchability of fertile eggs and hatchability of total eggs. Al-Daraji (2001a) reported that the mean numbers of the spermatozoa exhibiting progressive motility and the mean germ cells concentration showed a highly significant negative correlation with the total seminal plasma protein content both in fresh and frozen-thawed semen samples. Furthermore, it was

widely accepted that the number, viability, motility, survival and storage properties of spermatozoa are influenced by seminal plasma protein (Al-Daraji et al., 2001).

The lowest seminal plasma activities of AST and ALT enzymes were obtained in semen of T1, T2, and T3 groups. When sperm cell membrane damaged, AST and ALT enzymes are released into the extracellular medium (Al-Daraji et al., 2002a). Al-Daraji et al. (2002b) reported significant correlation between seminal plasma activities of AST and ALT enzymes following cellular disruption. Brown et al. (1971) examined several enzymes and selected AST and ALT release as the best indicator of cellular damage. Buckland (1971) suggested that the observed increase in AST and ALT activities of seminal plasma and semen during storage may be due to structural instability of the sperm. Al-Daraji et al. (2000) found positive correlation between activities of AST and ALT in seminal plasma and percentages of dead and abnormal spermatozoa. Differences in seminal plasma ALP activity for different treatments included in this study closely resemble differences in spermatozoa liveability and concentration.

Al-Daraji et al. (2001) reported that both of alkaline and acid phosphatase enzymes are involved in the metabolism of spermatozoa via the hydrolysis of carbohydrates. Al-Daraji (2002b) found positive correlation between ALP activity and spermatozoa concentration and liveability. Al-Daraji et al. (2002a) found highly significant positive correlation between the amounts of ALP in the seminal plasma and the number of spermatozoa per ejaculate.

Cholesterol concentration in seminal plasma exhibited differences between treatment groups. Cholesterol concentration was highest in the semen samples of control group, whereas the lowest cholesterol concentrations were recorded for semen samples of T1, T2 and T3 groups (Tables 2). Grunze and Denticke (1974) suggested that higher cholesterol to phospholipids ratio of cells such as spermatozoa promotes higher degree of membrane cohesion and impermeability. Davis (1976) suggested that cholesterol in seminal plasma of rabbits may inhibit fertilization by inhibiting membrane fusion during the acrosome reaction as a result of its incorporation into the lipid bilayers. Ansah and Buckland (1982) reported that the phenotypic correlation of seminal plasma cholesterol with fertility of frozen-thawed semen were negatively correlated as were the phenotypic correlation of seminal plasma cholesterol with fertility of fresh semen.

In conclusion, the results of this study showed that supplementing parsley in the diet of ganders resulted in significant improvement in semen and seminal plasma characteristics. Therefore, parsley can be used as a beneficial tool for improving reproductive performance

of ganders by inclusion this plant in their feeding program.

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