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# Effects of pre-slaughter feed withdrawal and sex on crop, carcass characteristics and some blood parameters in broiler chicken

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An excrement was carried out in 2×7 factorial arrangement to investigate the effects of pre-slaughter feed withdrawal (PSFW) and sex on carcass water uptake, hot and cold carcass yield, thaw fluid loss, some blood parameters and crop characteristics (pH, bacterial population, and weight) in broiler chicken. The factors were included PSFW duration (0, 4, 8, 12, 16, 20 and 24 hours) and sex (male and female). A total of 140 commercial broiler chickens (35 days of age) were provided from a local commercial producer and reared in a separate poultry shed up to 42 days of age. A significant increases was observed in crop pH and bacterial count by PSFW time increases ($P<0.01$). The gender caused a significant increase in crop weights in male ($P<0.01$). A significant increase trend in carcass water uptake ($P<0.05$) and thaw fluid yield ($P<0.01$) were observed up to 12 h thereafter a significant decrease trend were observed in this regard ($P<0.05$). The gender had no effects on water uptake and thaw fluid yield ($P>0.05$). Also, the gender had a significant increase on the hot carcass yield in male ($P<0.01$) but cold carcass yield was not affected by gender ($P>0.05$). Moreover, PSFW duration was not significantly affected on hot and cold carcass yield ($P>0.05$). Except an increase in cholesterol concentration in the male ($P>0.05$), the gender had no significantly effects on other blood parameters ($P<0.05$). Blood uric acid, glucose and cholesterol concentration were significantly affected by PSFW time ($P<0.05$). However, PSFW duration did not show a significant impact on blood concentration of triglycerides, high and low density lipoprotein (HDL and LDL). The results of current study showed that the gender and gender × PSFW time, overall, had no determinant effects on carcass characteristics and measured blood parameters. It can deduce that 4 hours PSFW duration had better efficiency on carcass traits but PSFW duration can last up to 8 hours. More investigation are need to study 4 or 8 hours PSFW times on other factors (e. g. carcass contamination and relish market).

**Key words:** Pre-slaughter feed withdrawal, carcass efficiency, blood parameters, microbial population

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## Introduction

The optimal condition of broiler chickens at the moment of slaughter should be known in order to produce the highest quality and quantity production. The restriction of broiler chickens feed before slaughter is a common practice that adopted in the USA and European countries since four decades ago (Hinton *et al*., 2000). Pre-slaughter feed withdrawal (PSFW) refers to the total time when birds are held without feed before processing (length of the feed deprivation in the house, catching, transportation and length of the time before slaughter in processing planet) (Northcutt, 2000). In normal operation, feed is withdrawn from birds 6 to 8 hours before catching, resulting in a PSFW total period of 8 to 12 hours. The most important aim of the PSFW is clearance of digestive tract from ingesta and digesta (Papa, 1991) which they are considered as the major sources of carcasses contamination during transportation and processing (Khosravinai *et al*., 2002). However, after feed withdrawal carcass dehydratation begins immediately and the prolonged periods of PSFW may adversely affect carcass yield and increases the population of pathogens in gastrointestinal tract (GIT) (Corrier *et al*., 1999; Khosravinia *et al*., 2005; Smith and Berrang, 2006). In addition, recycle of uric acid into body may occur and resulting in body problems. It has been shown that crop contents pH is one of the most important factor that influence crop bacterial population (Hinton *et al*., 2000). During PSFW, by empting of crop from feed, its antientrobacteriace activity was decrease and is associated with Lactobacilli *spp*. reduction (Hinton *et al*., 2000). Moreover, in absence of the feed, birds begin to consume highly contaminated bedding particles (Corrier *et al*., 1999). Many researchers have studied the alterations induced by PSFW in GIT (Shamoto and Yamauchi, 2000; Tarachai and Yamauchi, 2000) and has been indicated that the integrity of digestive tract adversely changed by PSFW in broiler chicken. The prolonged PSFW schedules alter the appearance of internal surface by reducing the villi width, crypt depth and mucous thickness (Thompson and Applegate, 2006). These factors may influence the digestion and absorption rate with subsequent changes in blood constituents. Nijdam *et al* (2005) showed that prolonged PSFW significantly decrease the blood glucose. It imposes negative energy balance in broiler chicken and force metabolism to use tissue fat and protein resources for maintenance (Buyse *et al*., 2002). These events can lead to alter blood parameters such as glucose, cholesterol and other lipoproteins.

Despite of bird's health, prolonged PSFW may also adversely affect carcass attributes. It has been shown that carcass water uptake during water immersion chilling significantly differ for broiler chickens subjected to various PSFW cues (Tayloe *et al*., 2002). The water holding capacity and thaw fluid

loss from defreezed carcasses also affected by duration of PSFW (Kuffman *et al*., 1986; Contreras-Castillo *et al*., 2007).

As some effects of feed withdrawal are unknown so researches are required to determine optimal PSFW time. Moreover, effects of the gender on crop and carcass traits as well as blood lipoproteins are rare. Thus, processing schedules need to be established to take in account feed withdrawal on gut integrity and fullness, birds welfare and subsequent effects on carcass contamination, quality and blood parameters. Therefore, this study was conducted to determine the effects of rising durations of PSFW and gender on some carcass attributes and blood constituents in commercial broiler chicken.

## Material and methods

### *Birds, Housing and Treatments*

One hundred forty straight run broilers (35 days of age) were provided from a local commercial producer and were transported to the poultry facility of the Lorestan University. Up on arrival, 10 males and 10 females were randomly allocated in 7 fresh wood shavings-floored pens where they supplied with commercial feed (3200 Kcal ME/Kg and 19.5 % CP). The feed and water were offered *ad libitum* up to 42 days of age. The extra birds were kept in a separate pen. At the end of 42 days of age, treatments initiated by weighting of all the birds individually coincide with removing the feeders from each pen. The birds in the first pen were slaughtered immediately (0 hours of factions as control) by hand using a conventional neck cut to sever the carotid artery and jugular vein. The killed birds bleed for 3 minutes, scaled at 60°C for 90 s and picked using an automatic feather picker and eviscerated manually. The eviscerated carcasses were weighed (shell weight or hot carcass) and chilled in ice and water mixture for 90 min. The chilled carcasses drained for 15 min and reweighed (chilled weight or cooled carcass). The same process was repeated for each group of birds while they were subjected to 4, 8, 12, 16, 20 and 24 hours fasting before being slaughtered.

### *Parameters Measurement*

The shell and chilled carcass yields were calculated as corresponding weight divided by the live weight at the initiation of treatments. The carcasses water uptake, hot and cooled carcass yield were calculated as the following equations:

Cooled carcass yield (%) = (cooled carcass weight/live weight before PSFW) × 100

Hot carcass yield (%) = (hot carcass weight/live weight before PSFW) × 100
Water uptake (%) = (chilled carcass weight – shell carcass weight)/ shell carcass weight × 100

***Blood Parameters Measurement***

The samples of blood were collected directly from carotid artery when it severed and they transport on ice to the laboratory for blood constituents analysis. Serum samples were taken and glucose, uric acid, cholesterol, triglyceride, LDL and HDL were measured by using the specific kits by spectrophotometer (UV) in 546 nm wavelength.

***Crop Characteristics***

The crops were collected by clamping across the pre and post crop esophagi using a surgical sterile forceps and immersed in boiling water for 1s to reduce external contamination (Ramirez *et al*., 1997). After weighing, physiological serum (10 ml) was added to contents of each crop and stomached for 30s. Then separated contents of each crop take into sampling dishes and pH was measured by using an electronically pH meter (Metrohom, Germany). The samples of the crop content were cultured on the nutrient agar (after serial distiller) and incubated 37 °C for 24 h. For each treatment, four randomly taken carcasses (2 male and 2 females) were freezed at -20°C for 7 days and then unfreeze by holding at 25°C for 12 hours. The carcasses before intake unfreeze in 19.5°C temperature and % 21.5 moister for 24 hours. Then the parts of the carcasses were deranging cleaner and weight.

***Thaw Fluid Yield***

Finally, the defreezed carcasses were drained to calculate thaw fluid loss by following equation:

Thaw fluid loss (%) = (unfreeze chilled carcass weight – deranging defreezed carcass weight) × 100/ unfreezed chilled carcass weight

***Statistical Analysis***

Data were analyzed using the ANOVA option of the general liner models (GLM) procedure of SAS software (SAS Institute, 2004). The model tested the main effects of sex and PSFW duration as well as the interaction between them using residual error. Means were separated using Duncan's multiple range test option of the GLM procedure of the same software ($P<0.05$).

## Results

### *Crop Traits*

The results of PSFW time and sex on crop characteristics are shown in Table 1. The total bacterial population and pH of crop contents were significantly increased up to 8 hours of PSFW ($P<0.01$) but they almost were remained constant afterward. No significant differences were observed in crop weights between PSFW treatments ($P>0.05$). The sex had no effects on crop bacterial population and pH ($P>0.05$).

**Table 1**. The effects of sex and PSFW time on the crop characteristics in broilers.

| Levels/Factors | Crop bacterial population($10^7$) CFU[2] | Crop weight (gr) | Crop pH |
|---|---|---|---|
| Sex | | | |
| Male | 53.26±16.97 | $2.07^{a}$±11.94 | 0.14±5.96 |
| Female | 90.32±22.2 | $0.72^{b}$±7.48 | 0.19±5.95 |
| PSFW time (hour) | | | |
| 0 | $0.02^{b}$±0.06 | $5.8^{a}$±24.42 | $0.28^{b}$±5.53 |
| 4 | $4.44^{b}$±4.82 | $1.72^{a}$±10.57 | $0.16^{c}$±4.75 |
| 8 | $9.68^{a}$±26.05 | $0.40^{a}$±6.68 | $0.05^{a}$±6.36 |
| 12 | $14.70^{a}$±25.79 | $2.99^{a}$±9.73 | $0.23^{b}$±5.90 |
| 16 | $22.28^{a}$±32.94 | $0.57^{a}$±6.64 | $0.17^{a}$±6.40 |
| 20 | $2.92^{b}$±7.93 | $0.19^{a}$±6.43 | $0.07^{a}$0±6.39 |
| 24 | $21.19^{a}$±39.4 | $0.39^{a}$±6.90 | $0.16^{a}$±6.46 |
| P Value | | | |
| Sex | 0.7731 | 0.0069 | 0.2745 |
| PSFW time | 0.0048 | 0.8316 | 0.0001 |
| PSFW time × Sex | 0.3772 | 0.2029 | 0.0127 |
| SEM | $10^7$×5 | 1.23 | 0.11 |

Means with different superscripts in the same column are significantly different ($P<0.05$). Means ± Standard Error, Colony Forming Unit

### *Carcasses Traits*

The results of carcasses traits in response to PSFW time and sex are presented in Table 2. The mean carcass water uptake percent significantly differed by PSFW ($P<0.01$). The highest water uptake percent was related to PSFW by 12 hours ($P<0.05$) as more fasting resulted in increased water uptake by 12 hours but further prolonged PSFW lead to decrease water uptake. The gender had no differences in this regard ($P>0.05$). Thaw fluid yield has not significantly affect by sex but PSFW duration showed a significant effect on

this variable (P<0.05). There was no significant difference among thaw flied loss for the carcass of birds subjected to 0, 4 and 8 hours of PSFW (P>0.05). However, extended fasting up to 12 hours an identical trend with carcass water uptake resulted in greater thaw fluid but prolonged PSFW above 12 hours showed an adverse effect in thaw fluid drainage. The PSFW was not significant affected on the hot and cooled carcass yield (P>0.05). In addition, the gender had not significant effects on cooled carcass yield (P>0.05) but, higher hot carcass yield was obtained by male gender (P<0.05).

**Table 2.** The effects of sex and PSFW time on carcass characteristics in broilers.

| Levels/Factors | Water uptake (percent) | Thaw fluid yield | Hot carcass yield | Cooled carcass yield |
|---|---|---|---|---|
| Sex | | | | |
| Male | 0.10±2.12 | 0.17±2.79 | 0.86$^{a}$±74.04 | 0.88±75.61 |
| Female | 0.16±2.15 | 0.25±3.09 | 0.34$^{b}$±73.80 | 0.34±75.37 |
| PSFW time (hour) | | | | |
| 0 | 0.15$^{c}$±2.09 | 0.21$^{c}$±2.99 | 1.33±73.26 | 1.38±74.80 |
| 4 | 0.14$^{c}$±2.07 | 0.12$^{c}$ ± 2.97 | 0.61±72.45 | 0.63±73.95 |
| 8 | 0.28$^{c}$±2.18 | 0.22$^{c}$±2.86 | 0.40±73.40 | 0.39±74.99 |
| 12 | 0.27$^{a}$±3.14 | 0.28$^{a}$±4.12 | 0.48±73.83 | 0.55±76.15 |
| 16 | 0.16$^{b}$±2.59 | 0.64$^{b}$±3.28 | 0.74±73.57 | 0.75±75.47 |
| 20 | 0.15$^{c}$±1.44 | 0.45$^{c}$±2.66 | 0.36±74.71 | 0.36±75.79 |
| 24 | 0.34$^{c}$±1.46 | 0.14$^{d}$±1.72 | 1.77±75.83 | 1.83±76.94 |
| P Value | | | | |
| Sex | 0.0919 | 0.0571 | 0.0384 | 0.8194 |
| PSFW time | 0.0001 | 0.0001 | 0.0529 | 0.3707 |
| PSFW time × Sex | 0.8360 | 0.8475 | 0.2212 | 0.6792 |
| SEM | 0.10 | 0.23 | 0.37 | 0.38 |

Means with different superscripts in the same column are significantly different (P<0.05). Means ± Standard Error.

### *Blood Parameters*

The results of PSFW time and sex on some blood parameters are presented in Table 3. The PSFW periods induced significant increase in blood glucose up to 4 hours PSFW (P<0.05) then remained constancy. The higher blood uric acid concentrations were observed in 8, 12, 16 hours PSFW time (P<0.05) which was not differ by 0 and 4 hours PSFW time (P>0.05). The blood triglyceride concentration differently were affected by PSFW times (P<0.05). Generally, the greatest and lowest contents were related to 16 and 12 hours PSFW times, respectively (P<0.05). The lowest blood cholesterol concentrations were achieved by 8 hours PSFW time (P<0.05) that was not

significantly differ with 12 and 16 hours PSFW times (P>0.05). The contents of blood HDL and LDL not followed from a distinct trend. The results showed that higher HDL concentration was related to 20 hours PSFW time (P<0.05) which was not significantly differ by 8, 16 and 24 hours PSFW time (P>0.05). Also, Higher LDL concentration was concerned to 20 hours PSFW time (P<0.05) which was not differ by 16 and 24 hours PSFW times (P>0.05).

**Table 3.** The effects of Sex and PSFW time on the concentrations of blood parameters

| Levels/Factors | Glucose | Uric acid | Triglyceride | Cholesterol | HDL | LDL |
|---|---|---|---|---|---|---|
| SEX | | | | | | |
| Male | 7.49±176.53 | 0.21±4.26 | 8.85±81.30 | 5.12$^{a}$±210.50 | 5.39±91.46 | 5.95±100.23 |
| Female | 4.76±159.19 | 0.28±4.19 | 5.77±64.50 | 3.86$^{b}$±180.85 | 4.55±77.79 | 6.81±92.46 |
| PSFW time (hour) | | | | | | |
| 0 | 7.95$^{a}$±201.25 | 0.32$^{ab}$±4.41 | 21.29±148.75 | 11.25$^{a}$±207.25 | 5.12±96.00 | 6.86±81.75 |
| 4 | 11.89$^{a}$±207.00 | 0.62$^{ab}$±4.35 | 9.38±84.12 | 10.95$^{a}$±204.37 | 8.55±100.43 | 8.01±86.43 |
| 8 | 11.96$^{b}$±157.12 | 0.21$^{c}$±2.99 | 2.16±43.62 | 11.53$^{b}$±169.75 | 7.87±76.50 | 7.40±84.37 |
| 12 | 6.88$^{b}$±168.00 | 0.37$^{a}$±5.34 | 5.04±67.00 | 7.09$^{ab}$±189.62 | 12.17±94.14 | 9.56±84.85 |
| 16 | 10.20$^{b}$±145.50 | 0.52$^{a}$±4.68 | 4.36±58.00 | 5.01$^{ab}$±190.25 | 7.29±79.57 | 14.13±109.28 |
| 20 | 8.53$^{b}$±153.12 | 0.29$^{bc}$±3.61 | 2.45±58.12 | 9.08$^{a}$±201.12 | 10.59±62.86 | 16.3±125.57 |
| 24 | 9.11$^{b}$±147.37 | 0.23$^{bc}$±3.87 | 1.67±54.87 | 8.43$^{a}$±214.75 | 11.59±84.33 | 12.96±108.83 |
| P Value | | | | | | |
| Sex | 0.0561 | 0.8212 | 0.3877 | 0.0001 | 0.0561 | 0.2541 |
| PSFW time | 0.0001 | 0.0086 | 0.1809 | 0.0106 | 0.0827 | 0.0754 |
| PSFW time × Sex | 0.0529 | 0.9817 | 0.7272 | 0.8726 | 0.0529 | 0.7893 |
| SEM | 4.69 | 0.17 | 5.25 | 3.81 | 3.65 | 4.49 |

Means with different superscripts in the same column are significantly different (P<0.05). Means ± Standard Error.

The gender had no significantly effects on blood glucose, acid uric, triglyceride, HDL and LDL concentration (P>0.05). But, higher blood cholesterol contents was observed in male birds (P<0.05).

### *Gender and PSFW interactions*

The results of PSFW time and sex interaction on crop and Carcasses traits as well as some blood parameters are presented in Tables 4, 5 and 6. The results have shown that only crop pH was significantly affected by gender and PSFW hours interaction (P<0.05) and other traits was not significantly differ between gender and PSFW interaction (P>0.05). The crop pH significantly affected (P<0.05) by sex × PSFW time interaction. The crop contents pH value was greater for male birds compared to females at 0, 4, 8, 16 and 20 h of PSFW (P<0.05). The crop pH significantly was greater for male at 0 h and significantly greater for female at 12 h (P<0.05).

**Table 4.** The effects 1 of sex and PSFW time interaction on the crop characteristics in broilers.

| Treats Levels\Factors | | Crop bacterial population ($10^7$) CFU[2] | Crop weight (gr) | Crop pH |
|---|---|---|---|---|
| Sex | Time | | | |
| Male | 0 | 42.62±16.31 | 26.45±7.01 | $5.68^{bc}$±0.31 |
| Female | 0 | 13.75±0.00 | 16.30±0.00 | $4.91^{de}$±0.00 |
| Male | 4 | 63.10±44.67 | 10.37±3.44 | $6.32^{de}$±0.09 |
| Female | 4 | 90.22±89.90 | 10.77±1.70 | $5.89^{e}$±0.00 |
| Male | 8 | 45.33±81.87 | 7.40±0.51 | $6.44^{a}$±0.01 |
| Female | 8 | 67.62±54.26 | 5.97±0.14 | $6.27^{ab}$±0.06 |
| Male | 12 | 45.71±25.96 | 12.77±5.92 | $5.45^{dc}$±0.19 |
| Female | 12 | 58.80±31.05 | 6.70±0.68 | $6.35^{ab}$±0.13 |
| Male | 16 | 15.75±25.00 | 7.53±0.32 | $6.58^{a}$±0.03 |
| Female | 16 | 50.14±48.86 | 5.30±0.00 | $5.89^{abc}$±0.00 |
| Male | 20 | 10.58±43.25 | 6.77±0.12 | $6.47^{a}$±0.04 |
| Female | 20 | 52.73±41.23 | 6.10±0.25 | $6.31^{ab}$±0.13 |
| Male | 24 | 59.67±22.69 | 7.43±0.59 | $6.32^{ab}$±0.09 |
| Female | 24 | 72.83±33.51 | 6.37±0.39 | $6.60^{a}$±0.31 |
| P Value | | 0.377 | 0.203 | 0.013 |
| SEM | | 1.34 | 1.23 | 0.11 |

Means with different superscripts in the same column are significantly different (P<0.05). Means ± Standard Error, Colony Forming Unit

**Table 5.** The effects of sex and PSFW time on carcass characteristics in broilers.

| Treats Levels\Factors | | Water uptake (%) | Thaw fluid yield | Hot carcass yield | Cooled carcass yield |
|---|---|---|---|---|---|
| Sex | Time | | | | |
| Male | 0 | 2.06±0.15 | 2.76±0.37 | 71.91±0.00 | 73.39±0.45 |
| Female | 0 | 2.10±0.23 | 3.23±0.19 | 47.20±2.22 | 75.78±2.31 |
| Male | 4 | 1.19±0.20 | 2.94±0.18 | 70.32±1.15 | 71.65±1.23 |
| Female | 4 | 2.14±0.18 | 3.00±0.18 | 73.31±0.60 | 74.88±0.60 |
| Male | 8 | 2.03±0.30 | 2.82±0.33 | 73.94±0.66 | 75.44±0.58 |
| Female | 8 | 2.25±0.40 | 2.90±0.35 | 73.12±0.48 | 47.77±0.51 |
| Male | 12 | 2.93±0.18 | 4.75±0.29 | 73.45±0.94 | 75.60±1.01 |
| Female | 12 | 3.29±0.44 | 4.10±0.22 | 74.09±0.51 | 76.53±0.62 |
| Male | 16 | 2.63±0.22 | 2.25±0.19 | 74.48±2.50 | 76.43±2.55 |
| Female | 16 | 2.57±0.21 | 4.32±1.10 | 73.21±0.41 | 75.09±0.41 |
| Male | 20 | 1.33±0.17 | 2.45±0.23 | 75.34±0.54 | 76.34±0.50 |
| Female | 20 | 1.50±0.21 | 2.87±0.93 | 74.35±0.48 | 75.47±0.47 |
| Male | 24 | 1.88±0.25 | 1.94±0.11 | 78.97±5.55 | 80.48±5.74 |
| Female | 24 | 1.26±0.48 | 1.58±0.19 | 74.37±0.55 | 75.29±0.461 |
| P Value | | 0.836 | 0.847 | 0.221 | 0.68 |
| SEM | | 0.33 | 0.12 | 0.37 | 0.38 |

Means with different superscripts in the same column are significantly different (P<0.05). Means ± Standard Error.

**Table 6.** The effects of Sex and PSFW time on the concentrations of blood parameters.

| Treats Levels\Factors | | Glucose | Uric acid | Triglyceride | Cholesterol | HDL | LDL |
|---|---|---|---|---|---|---|---|
| Sex | Time | | | | | | |
| Male | 0 | 206.67±7.26 | 4.33±0.40 | 149.33±28.65 | 212.50±14.38 | 96.00±6.97 | 86.83±7.90 |
| Female | 0 | 185.00±85.00 | 4.64±0.74 | 147.00±19.00 | 191.50±10.50 | 96.00±2.00 | 66.50±8.50 |
| Male | 4 | 323.00±11.35 | 4.58±0.96 | 92.75±14.04 | 228.75±12.30 | 116.67±12.57 | 99.00±11.78 |
| Female | 4 | 182.00±10.71 | 4.12±0.92 | 75.50±12.80 | 180.00±3.56 | 88.25±7.86 | 77.00±9.34 |
| Male | 8 | 162.50±22.25 | 2.85±0.20 | 48.00±2.34 | 182.50±20.03 | 78.50±15.97 | 84.25±7.74 |
| Female | 8 | 151.75±12.40 | 5.10±0.48 | 39.25±1.89 | 157.00±10.50 | 47.50±5.60 | 74.50±11.44 |
| Male | 12 | 184.50±3.43 | 5.58±0.60 | 66.50±9.08 | 207.50±4.03 | 107.25±4.64 | 87.00±7.10 |
| Female | 12 | 151.50±50.30 | 4.51±0.49 | 67.50±5.98 | 171.75±2.29 | 76.67±26.97 | 82.00±23.06 |
| Male | 16 | 131.00±17.80 | 5.68±1.00 | 65.75±2.21 | 201.00±5.48 | 85.00±17.62 | 105.67±24.66 |
| Female | 16 | 160.00±5.40 | 4.84±0.31 | 50.25±3.20 | 179.50±3.17 | 75.50±4.25 | 112.00±19.73 |
| Male | 20 | 162.50±2.75 | 3.50±0.53 | 58.50±1.85 | 215.00±10.22 | 65.00±17.67 | 138.25±21.95 |
| Female | 20 | 143.75±16.54 | 3.72±3.34 | 57.75±4.96 | 187.25±12.32 | 60.00±12.42 | 108.67±25.44 |
| Male | 24 | 141.50±15.89 | 3.92±0.26 | 54.25±2.66 | 225.25±13.83 | 97.00±21.00 | 96.50±29.50 |
| Female | 24 | 153.25±10.56 | 3.81±0.42 | 55.50±2.40 | 204.25±8.16 | 78.00±14.90 | 115.00±15.40 |
| P Value | | 0.053 | 0.982 | 0.727 | 0.873 | 0.857 | 0.789 |
| SEM | | 4.69 | 0.17 | 5.52 | 4.69 | 3.65 | 4.49 |

Means with different superscripts in the same column are significantly different (P<0.05). Means ± Standard Error.

## Discussions

### *Crop Traits*

The trend of poultry GIT pH is acidic from beginning to end and commencement at least pH=2.6 in gizzard up to pH=6.7 in duodenum. The main reason to changes in environmental pH is changes in the crop bacteria population. As evident in Table 1 the gender effects on crop pH is not significant (P>0.05). This similar pH trend caused bacterial population trend in the crop does not significantly differ (P>0.05). The base on these observations acidity changes in crop and its following bacterial populations was mostly affected by the presence or absence of food in crop and sex is less involved the chickens. By 4 hours of PSFW crops were emptied from ingesta, however due to sampling variation, no significant differences were noticed for crop weight in the birds subjected to increasing PSFW duration. The previous researches indicated that crop bacterial count increases in prolonged PSFW practices (Humphrey *et al*., 1993; Ramirez *et al*., 1997; Corrier *et al*., 1999). It has been shown that such a higher incidence in bacteria is attributed with change in crop pH. Hinton *et al* (2000) in concord with the finding of this study showed that crop pH was increased from 5.5 to as high as 6.5 following feed withdrawal.

Moreover, Corrior *et al* (1999) reported that a higher bacterial load in crop of the feed deprived broiler chickens is attributed to birds ingesting contaminated litter particles during scavenging the litter which this point must be considered.

Accordingly, fasting time, significant effects was domestic in crop pH ($P<0.05$). Hinton *et al* (1983, 2000) also previously had reported similar results and noted that the main reason for this drop in pH is bacterial activity decrease which reduced the concentration of acetic acid, propionic and especially lactic acid in the crop contents. The crop weights were not significantly affected by different periods of PSFW ($P>0.05$) and higher crop weights at 0 PSFW was related to crop fulfill in the early hours of PSFW. Times of PSFW had significant effects on the crop bacterial population ($P<0.05$) as by hours increases crop bacterial population was increased. The reason for this increase in bacterial populations likely is increasing pH value and become favorable crop conditions for growing a wide range of bacteria. These consequences confirmed the results of Hinton *et. al.,* (2000).

***Carcasses Traits***

The PSFW time had no significant effects on hot and cold carcass yield ($P>0.05$). The most studies in this field indicated that an increase in carcass yield after PSFW periods. For example Young and Smith (2004) were conformed that the nonlinear association between PSFW and carcass water uptake and carcass yield will increase to hours of PSFW increases. Other researches reported that decreased carcass yield after 3 to 12 hour PSFW (Contreras *et. al*., 2007) and too after 9 to 10 hours PSFW (Warriss *et. a.l*, 1988) Lyon *et. al.,* (1991) reported carcass yield increased after 8 to 12 hours PSFW duration. Based on available data at Table 2, 12 hours fasting had the highest cold and hot carcass weight and around the simillar time the most ratio of water uptake by carcasses was recorded. Thus the part of the cold carcass weight magnitude in the time is related to increase in water uptake by carcasses (carcasses during cooling stage). As it can be seen in Table 2 carcass water uptake after different periods of prohibition feed intake imposed was not significantly different ($P>0.05$). However, the trend of increasing water uptake increased to 12 hours PSFW and then gradually decreased. The carcass water uptake, water uptake almost followed a quadratic curve. However, it must note that increase water uptake after 12 hours due to increasing carcass weight in this time. This finding was similar to the results of Young and Smith (2004).

***Blood parameters***

Among the blood parameters the cholesterol only was significantly influenced by gender ($P<0.05$). Other parameters were not affected by gender ($P>0.05$). Freeman and *et. al.,* (1983) showed that the concentration of unsaturated fatty acids for roosters is lower than hens and the ratio of glucose to

fatty acid are differ between two gender. The lower concentrations of unsaturated fatty acids in roosters rather than hens show higher levels of blood glucose in compared with hens. The most studies were considered PSFW time on blood parameters and gender were less studied (Van derwal *et. al*., 1999; Nijdam *et. al*., 2005).

The levels of blood glucose (Van derwal *et al*., 1999; Nijdam *et al*., 2005) and blood uric acid decrease with prolong PSFW time but levels of the blood cholesterol increase during PSFW periods. The PSFW duration has not significantly affect the other blood factor including triglyceride, HDL and LDL concentrations. However, blood triglyceride levels decreased after PSFW time. The similar findings by Buyse *et al* (2002) and Nijdam *et al* (2005) confirm that blood triglyceride and uric acid concentrations decrease in prolonged PSFW schedules. The finding of this study support the results of other researches by Taylor *et al* (2002), Zuidhof *et al* (2004) and Khosravinia (2010) where PSFW duration confined to 4 to 8 hours.

### *Gender and PSFW interactions*

Among studied traits only crop pH were significantly influenced by gender and PSFW hours interaction ($P<0.05$) and other traits was not significant between gender and PSFW interaction ($P>0.05$). The significant differences were exists between sex for crop pH at 0 and 12 hours PSFW ($P<0.05$). The pH at 0 hour was higher for males rather than females and inverse observation was exited in 12 hours. The trend of increasing initial pH value of the time contraindicated in the final hours already was dissected, but little information was available regarding interaction of PSFW time and sex and more investigate are needed.

## Conclusion

In conclusion, continue feeding of the broilers until slaughter may have some stress and adversely affected the carcass efficiency compared with broilers that have not access to feed. The feed withdrawal time of broilers before slaughter is critical to broiler production and welfare. The results of current study showed that almost 4-8 PSFW time was optimum for crop, carcass traits and lead to less contamination. Moreover, gender as well as gender × PSFW interaction was less influence carcass and blood parameters.

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