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RESEARCH ARTICLE

Response of Broiler to Supplementation of Human Oral Rehydration Salt during Pre-Slaughter Fasting

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ABSTRACT

Mitigation measures are means to remunerate the losses by pre-slaughter feed withdrawal practices of broiler chicken. The therapeutic effect of drinking with oral rehydration salt solution (ORSS) versus tap water (TW) during fasting (0-h versus 24-h versus 48-h) period was investigated in this trial. Data on water intake, meat quality, carcass traits and sensory of broiler chicken were subjected to a two-way ANOVA in a complete randomized design. The water intake of broiler was significantly higher before fasting while highly significantly lower after feed removal. Water with ORSS was consumed by broilers significantly higher over TW after feed withdrawal. Live weight loss was significantly higher in ORSS group while consistent significant higher live weight loss in 48-hr fasted chicken in all tested periods of fasting $P< 0.05$. Slaughter weight, hot carcass, liver weight, and gut (full, empty, and residual) were significantly affected by the fasting period while similar average values in dressing percentage. Mean values of meat pH and cooking loss were statistically significant by fasting while comparable in effect of water. Both drinking water and the fasting period did not alter the meat sensory profile. All parameters tested, drinking water did not interact ($P> 0.05$) with fasting periods except on texture and overall acceptability of meat sensory. Broilers fasted within 48 hours significantly lost live weight while pH and cooking loss responded positively and moderate acceptability on sensory of meat. ORS therapy significantly induced water intake but negatively affect live weights.

Keywords: Feed Withdrawal, Oral rehydration, Water Intake, Carcass Characteristics, and Meat Quality.

INTRODUCTION

Commercial broilers are exposed to several stressors before slaughter, including feed deprivation, crafting density, and transportation (Delezie, Swennen, Buyse, & Decuypere, 2007). Feed consumed by broilers is only of economic value if it is converted to saleable pounds of meat (Smidt, Formica, & Fritz, 1964). Since the early days of commercial poultry production, preparing broilers for processing included a time of feed withdrawal from the birds so that all of the feed consumed before processing was converted to edible tissue. However, the no tolerance for ingesta or fecal contamination policy from FSIS, (1996) increased the importance of proper FW periods before slaughter. Although the concern for converting feed to muscle was still important, preventing ingesta or fecal contamination of broiler carcasses was a significant concern and required a longer FW period than for just converting feed to edible tissue.

Usually, before slaughtering of birds, while they are still on the poultry cages, their feed is removed and they undergo fasting that aims to minimize the contents of gastrointestinal tracts, and subsequent contamination of the carcasses by fecal matter during transport and evisceration (Contreras-Castillo *et al.,* 2007). But, concern about body weight losses reducing the economic value of the carcass is the main reason why feed fasting was not practiced by many poultry raisers. The effect of an extended FW time was recognized as having a negative effect on BW and carcass yield. May and Brunson, (1955) were the first to report a significant reduction in eviscerated carcass yield in both males and females after a feed withdrawal period of 24 hours but little effect on yield with shorter FW periods. An effective feed withdrawal program should provide adequate clearance of the digestive tract while controlling shrink and yield losses (Smidt, *et al.,* 1964; Veerkamp, 1978; Lyon, *et al.,* 1991; Papa, 1991; Moran Jr and Bilgili, 1995). A mitigation action may be effective to lessen the adverse effect of pre-slaughter feed deprivation.

Oral Rehydration Salt solution was found to help correct the acidosis in children with acute diarrhea (Ghishan, 1990), these formulations included glucose more as a source of nutrition than as the major driving force for fluid absorption. The key to the success of ORT is that it replaces the fluid being lost, circumventing the need for intravenous replacement in 80 to 90% of the cases of mild-moderate diarrhea and is lifesaving in acute diarrheal diseases (Rao, 2004). Some of the symptoms seen in humans experiencing gastrointestinal disturbance are similar to those experienced by broilers deprived of feed and heat stress, normally water and electrolyte loss (Sayed and Downing, 2011). However, basic information about the influence of ORS treatment on the performance of broiler undergoing pre-slaughter fasting is poorly documented. Consequently, this trial was initiated to determine the alleviatory factor of ORS during pre-slaughter feed withdrawal on the live weight losses, meat and carcass traits, and sensory characteristics of broiler chicken.

MATERIALS AND METHODS

Subject animal

A total of ninety (90) heads of 28-30 days old marketable sized broiler of almost similar body weight were acquired from a backyard farm. The birds were randomly selected and divided into two groups (group 1: ORSS; group 2: Tap water). In every group, the birds were further divided into three sub-groups (sub-group 1: 0-h fasting; sub-group 2: 24-h fasting; sub-group 3: 48-h fasting) replicated three times having five birds each and started the six-day trial conducted at Surigao State College of Technology-Mainit Campus (SSCT-Mainit) Poultry House.

Treatment

The human ORS (Hydrite by Amherst Lab. Inc.) was dissolved in water at a ratio of one pack (4.1 g) per 300 ml water. The solution contains 5.00 mmol Sodium, 1.33 mmol Potassium, 4.33 mmol Chloride, 0.76 Citrate, and 5.00 mmol Glucose per liter of water which was given to the ORSS treatment group starting in three days before fasting. Feeds were removed totally during fasting while drinking water (ORSS and TW) remained until slaughter time. Water in a plastic container was securely tied via a plastic cord attached to every cage wall.

Slaughtering and processing

To make the slaughtering simultaneous, the birds under 48-h fasting from each group were treated with ORSS on day-1 and fasted on day-4, followed by 24-h fasting treated on day 2 fasted on day-5, while 0-h fasting treated on day-3 until day-6. All birds were simultaneously slaughtered and processed for analysis on day-6. Before slaughtering, the birds were assessed for the final weight at slaughter. Two chickens close to average per cage were slaughtered simultaneously. The head was dislocated, eviscerated, and evaluated the warm carcass weight and intestinal tract before they were transported to SSCT-Mainit Campus Food Laboratory and chilled for two hours at 0.5 ^{0}C before the preparation of meat samples for analysis.

The following parameters were calculated using the formula:
Water intake = Water offered – Water remained
Live weight loss = Pre-fasting weight – Post-fasting weight
% live weight loss = Pre-fasting weight/Post-Fasting weight x 100
Dressing percentage = hot carcass weight/Post-withdrawal weight x 100
Residual gut fill = Digestive tract full – Digestive tract full empty

Determinationof pH and cooking loss of meat

The pH of meat from broiler chicken breast in each sample was measured in duplicate by a Digital pH Meter (PH-108). Beforehand, the pH-meter was calibrated using standardized buffers of pH 4.0, 6.9 as mentioned by (Siekmann et al., 1985). Approximately 10 g of ground meat was mixed with 100 ml distilled water and blended for 30 seconds at a high speed. The pH meter electrode was immediately inserted after the blended sample was poured into a clear glass. Cooking loss percentage determination was done by oven-cooking of meat samples. The 10 g meat was subjected to a maximum oven temperature of 150 ^{0}C for one (1) hour and was let to cool for 30 minutes until the temperature normalizes. The weight of raw and cooked samples was recorded. The following equations were used to determine the percentage cooking loss:

Cooking loss % = Weight of raw meat – Weight of cooked meat / Weight of raw meat x 100

Sensory testing

Meat sensory attributes viz. odor/aroma, appearance, texture, taste, juiciness, and overall acceptability were scored by panel evaluators (untrained) using the five-point hedonic scale. Approximately 10 g of meat samples were steamed for 30 minutes (no seasoning and spices). Each sample was coded and randomized according to Kwanchai & Arturo, (1984) methods and placed in disposable plastic cups ready for evaluation by 10 panelists composed of faculty, staff, and students of SSCT-Mainit Campus done in the college food laboratory. Before testing, the panel evaluators have oriented and provided score sheets for the basis of scoring using the five-point scale namely: 5-extremely acceptable, 4- moderately acceptable, 3- acceptable, 2- moderately unacceptable, and 1- unacceptable. The panelists cleansed the palate by drinking water after every sample.

Statistical analysis

Data gathered was subjected to statistical analyses using two-way ANOVA in CRD using SPSS version 20 to determine the statistical difference of main effects and interactions between drinking water and fasting periods on the water intake, meat quality, carcass traits, and sensory attributes of broiler chicken. To determine homogeneity, Tukey HSD was used at a 5% level of significance.

RESULTS

Water intake

Effects of drinking water (ORSS vs. TW) and fasting periods (0, 24, and 48 hours) on water intake of broiler chickens before and after feed withdrawal are presented in (Table 1). Neither before nor after feed withdrawal, the water intake of broiler was significantly affected by fasting but not significantly different by the main effect of drinking water and interaction of drinking water*fasting periods ($P > 0.05$). In the study, the water intake of the chickens was measured from the amount of water given less the water remained daily. Based on the results, the daily water intake increment before fasting were all highest in 0-h fasted followed by 24-h fasted while lowest total water consumption in 48-h fasted chickens in three days before feed withdrawal (Table 2). The average value differences among 0-h, 24-h, and 48-h fasting were all significant to each other. Meanwhile, water intake by broiler after feed removal was significantly lesser than water intake before fasting. The 48-h fasted chickens consumed significantly higher total values over the 24-hour fasting chickens during fasting regime. No water consumption was noted in 0-h fasted chickens.

Live weight loss

Total weight losses during fasting are presented in (Table 3). The total live weight loss and % total live weight loss significantly higher in 48-h fasted over the 24-h fast. No live weight losses observed in 0-h fasting chickens. While data on drinking water treatments showed significantly higher total live weight loss and % total live weight loss in ORSS treated over the TW group.

Carcass characteristics

The mean summary of the effects of ORSS and TW during feed withdrawal on carcass characteristics of broiler chicken is shown in (Table 4). All of the parameters of carcass characteristics except dressing percentage were significantly influenced the fasting period while ORSS treatments failed to show statistical differences on carcass parameters. No hour fasting*drinking water interactions were noted. Slaughter weight is the final weight of birds after feed fasting, showed the highest final weight on the non-fasted chickens compared to the lowest 48-h fasted. The mean value of 24-h fasting did not significantly differ to either 0-h or 48-h fasted chicken groups. The resulting significant different values of warm carcasses, as well as the weight of birds at slaughter data, were homogenous in the pattern. The percentage of the live animal weight that becomes the carcass weight at slaughter as dressing percentage of broiler in drinking water and period of fasting with Drinking water vs. fasting period interaction showed no differences ($P > 0.05$). The liver was separately weighted after the evisceration. The heaviest liver was observed in 0-h fasted chickens while in the 0-h fasted chickens, the liver weight did not vary from the other two groups. The group which had the lowest liver weight was observed in the 48-h fasted chickens. Alimentary tract or digestive tract of broiler chicken, the 0-h fasting were all highest among digestive tracts (full, empty, and residual gut fill) parameters and 48-h fasted chickens were lowest in the foregoing. The digestive tracts (full) of 24-h fasted was statistically different to both 0-h and 48-h fasted, while the digestive tract (empty) was comparable to 0-h and significant to 48-h fasted chickens. Moreover, the residual gut fill of 24-h fasted chickens was statistically significant to 0-hr but comparable to 48-h fasted chickens.

Meat quality

As shown in Table 4, an analysis of the pH of broiler chicken breast meat means revealed no statistical difference between the means for ORSS and tap water groups. The pH means of the fasting periods were significantly different ($P < 0.05$) with the mean for 48-h being the highest and the mean for 0-h has the lowest while the mean of 24-hr fasting is intermediate and not significant to either 48-hr or 0-hr fasted chickens. The data of cooked meat and cooking loss of broiler chicken meat are likewise shown in Table 4. The weight of cooked meat and percent cooking loss have significant (*P*< 0.05) effects found for the main effect of fasting. But the main effect of drinking water falls short of statistical significance, and Drinking water x Hour fasting interaction, (*P*> 0.05) on the weight of cooked meat and % cooking loss. Meanwhile, the two parameters were exactly contrasting in the mean values pattern. As shown in Table 4, the weight of cooked meat is significantly highest in 48-h fasted followed by 24-h fasted and the lowest is 0-h fasted compared to the percentage cooking loss, the highest is in 0-hr fasted followed by 24-h fasted while the lowest is 48-h fasted.

Sensory of meat

The summary of different organoleptic characteristics as affected by the drinking water treatment fasting period is shown in Table 5. All attributes viz. odor/aroma, appearance, texture, taste, juiciness, and overall acceptability have no significant differences by the main effects of drinking water and feed withdrawal period (*P*> 0.05), but drinking water interacts to the meat texture and overall acceptability in levels of hour fasting (*P* < 0.05).

DISCUSSION

Consumption of water by broiler was significantly different before and after feed fasting. The intake of water was significantly higher before the feed was removed when compared to the intake of water during fasting Table 1. The result manifested that feed deprivation declines water consumption activity. Drinking water activity and feed intake are positively correlated, such that if the feed is not available will surely affect water intake. The demand for water is dependent on the amount of dry matter taken. In previous literature, the ratio of water consumption and dry-matter intake (DMI) is relatively constant at approximately 2:3 for turkey Degen, Kam, Rosenstrauch, & Plavnik, (1991). Fairchild and Ritz, (2009) reported, the recent water consumption for chicken normally ranges from 1.6 to 2.0 times that of feed intake. In the study, significant higher water intake before feed fasting was consistent with 0-h fasted chickens from day 1-3, followed by 24-h fasted while the 48-h fasted chickens were lowest Table 2. The significant differences in water consumption before fasting among the group fasted may be explained by the disparity of chicken sizes. The 48-h fasted were slightly smaller in sizes since they were treated and fasted ahead from the other two groups. This confirms that the amount of water intake is relatively proportional to the size of the animal wherein the larger the size of an animal the higher is the demand for dry matter intake.

Similarly, the water intake behavior in the drinking water group of chickens was higher before feed withdrawal while lower at fasting. The ORS group received more water over tap water (2051.83 vs. 1837.89) respectively before fasting, but the value differences were not significant. (Borges et al., 2000) observed an increased intake of water in broilers chicken supplemented with 1.0 percent KCl from day 21 onwards. However, the effect of ORSS on water intake after feed removal was limited but the total value of the averages showed higher in ORS treated over the pure tap water (971.61 vs. 807.38). It is established that supplementation of drinking water or in diet form with electrolytes improved the intake of water in birds reared in heat stress surroundings (Ahmad et al., 2008; Fairchild and Ritz, 2009). Live weight loss refers to the weight shrinkage by broilers during feed withdrawal. A significant higher live weight loss and % live weight loss was noticed in 48-h fasting chickens when compared to 24-h fasting while 0-h or unfasted chicken groups recorded no weight loss. A clear evidence that the longer the animal has withdrawn from feeds the more weight loss is observed due to excretion of fecal matter in digestive track (Wabeck, 1972; Veerkemp, 1886) and because of the removal of water from the body due to the metabolic process of body tissues for energy maintenance (Salmon, 1979). Broilers' weight loss after the first 6 hours fasting is largely due to the decrease in the content of the digestive tract (Veerkemp, 1986).

Beyond 6 hours of fasting, moisture and nutrients are drawn from reserved nutrients and body tissues. For our study, it showed 108.33 g live weight loss with 8.18 % live weight loss on the first 24 hours versus 65.00 g live weight and 5.40 % live weight loss respectively after 48 hours of feed deprivation (Table 3). The electrolyte component of human ORS in water during pre-slaughter fasting failed to regulate the negative effects on the live weights of broiler chickens. Rahi, Afrin, Howlider, & Ali, (2015) KCl in drinking water during hot and humid summer had no effect ($P>0.05$) on growth and meat quality characteristics of broilers except feed conversion ($P<0.05$) at different target weights; however, other studies have shown drinking water supplemented with 0.6% potassium reduced panting-phase blood pH to 7.31 and significantly increased live weight gain by 14.5 ($P<0.05$) and 7.9% ($P<0.05$) at 28 and 42 days of age (Ahmad *et al*., 2008). Our findings showed higher total live weight loss and % total live weight loss in ORSS group compared to tap water, however, comparing their average value differences it showed no significant. This discrepancy in the results can be explained by different types of stressed imposed on chicken between the studies. Pre-slaughter feed withdrawal stress induces rapid potassium and sodium excretion along with the emptying of digestive tract contents. The potassium excretion is rapid during the early part of fasting and then tappers off to a constant level of about 10 to 15 mEq/day. Similarly, excretion of sodium is also triggered early in feed withdrawal, continuously decline to between 1 and 15 mEq/day, losses that remain even through extended withholding caloric intake (Weinsier, 1971).

Higher carcass weight was noted on 0-hr fasting compared to 24-h fasted and 48-h fasted chickens which were anticipated due to apparent higher slaughter weight because 0-hr chickens were not fasted (Table 4). However, dressing percentage as the relationship between the carcass weight and its live weight before slaughter was not affected by fasting periods. The recent findings supported the study of Saffle & Cole (1960) that dressing percentage was not significantly affected by fasting when using off-feed weights. In the first 24 h of fasting, the pig can losses up to 5% of its live weight, at an approximate rate of 0.2% per hour, or 0.25 kg/h, resulting in a live weight loss of approximately 5 kg after 24 h of fasting (Faucitano, Chevillon, & Ellis, 2010). However, the live weight losses are more linked to the defecation of urine and feces rather than to body tissues and consequently carcass weight is not affected (Beattie, Burrows, Moss, & Weatherup, 2002). While the not significant effect of drinking water with electrolyte in this trial was probably following the earlier findings of Rahi, Afrin, Howlider, & Ali, (2015) KCl in water during hot and humid summer was not significant ($P>0.05$) on growth and characteristics of meat yield broilers excluding feed conversion ($P<0.05$) at different target weights. Similarly, (Souza et *al.,* 2002) did not mention any effect of potassium chloride supplementation on carcass response or abdominal fat. Our case, though comparable in between water groups, it was observed the ORSS treated chickens had slightly lower dressing percentage than tap water which can be explained by rapid excretion of sodium and potassium during fasting before it was absorbed in the muscle tissues that will form part of the carcass.

The liver may almost be depleted of glycogen if they have fasted for more than 24 hours or longer. A remarkable lowest liver weight values in 48-hours fasted in this trial probably due to the relatively smaller sizes of the liver in proportion to their body weight plus the massive glycogen depletion by feed withdrawal and post-partum glycolytic activities. The decline in liver weight is mainly attributed to a loss of water and glycogen (Jones, Rompala, & Haworth, 1985); the weight of liver, glycogen reserve, and concentration of circulating glucose significantly reduced after long feed fasting (Warriss, *et al*., 1993). The electrolyte component of ORS did not counter the effect of fasting on liver weight shrinks in this trial. This report upheld the claims of Koreleski, Świątkiewicz, & Arczewska, (2010) that levels of K and Na not significant on breast meat yield, abdominal fat content in the carcass quality and relative weights of liver and heart. The result showed the ORSS treated chicken group had a slightly higher weight of the liver over the tap water group (Table 4).

Remarkable highest digestive tracts (full) was observed from non-fasted chickens while lower in the fasted group because of the presence of fecal matter and undigested food. Castroverde, Olarve, & Cruzana, (2010) observed that higher weight of intestinal tract and residual gut fill were found in chicken with zero fasting hour compared to fasted broilers due to gastrointestinal content that is still intact since they have not fasted. ORSS supplementation in drinking water before and after fasting together with interactions showed no significant effect on digestive tracts (full, empty, and residual gut fill). Earlier reports emphasized that glucose and Na salts in ORT solutions might have increase water absorption in the intestine, and therefore enhanced water retention consequently affects gut-weight. Recent studies showed that water absorption in the gut is related to solute uptake and that glucose remarkably enhances both salt and water absorption (Gagnon, Bissonnette, Deslandes, Wallendorff, & Lapointe, 2004). The contrasting results of the study can be explained by the rapid excretion of fluids along with the emptying of the digestive tract during fasting. The rate and levels of pH reduction are the main determining factors of meat quality Van Laack, (2000). Table 4 shows a higher pH of meat is detected in 48-hr fasted followed by 24-hr and 0-hr fasting chickens. Ngoka & Froning, (1982) indicated that feed withdrawal has a significantly altered meat final pH, water retention capacity, live weight and moisture content of turkey breast muscle when compared to the fed group. After slaughter, when the muscle is transformed into the meat, anaerobic glycolysis results in a pH decline. Our study found a significant pH decline in non-fasted chicken resulted from high glycogen levels at slaughter because they are unfasted. If the glycogen reserves are depleted before slaughter, the ultimate pH does not fall to 5.3-5.6. It remains high at 6.8, (Greaser, 1986). Fasting or inadequate feeding in the period of pre-slaughter lowers glycogen reserves. Ultimate pH is determined largely by levels of muscle glycogen at death. They stressed that the formation of lactate declines pH (Greaser, 1986).

Cooking loss and pH of meat values are positively correlated. As the pH decreased, the quality of the final produce increased because the cooking losses were less (Contreras-Castillo, 2007). Moreover, loss of weight during cooking of meat is a result of water and fat loss. After heating the muscle fiber protoplasm coalesces which results in contraction of fiber and muscle cell (Price, 1971). In comparison to our findings, the higher percentage of cooking loss was in 0-hr fasted chicken because they had lots of water and fats since they have not fasted. Furthermore, pre-harvest fasting for 24-hr would result in cooking yield increase of 1.6% compared to 18-hr, which confirms the correlation (r=0.7 to 0.8) between ultimate meat pH and technological yield of cooked hams (Monin, 1988). A higher ultimate pH (pHu) is related to a darker color, reduced drip loss (higher WHC and WBC) and tougher meat (Warner, 1994; Pearson & Young, 1989). Pale breast meat of broiler has a lower water-holding capacity, causing in 8-10% reduction in cooking yields (van Laack *et al.,* 2000). Pale colored meat and low WHC correlate with a lower in ultimate pH. Ultimate pH of pale broiler breast meat approximately 5.70 versus 5.96 in normal-colored breast meat (van Laack, 2000). Apple, Unruh, Minton, & Bartlett, (1993) observed the administration of electrolytes did not affect lamb carcass quality. Contrary to (Babji, Froning, & Ngoka, 1982) under the conditions of this study, pre-slaughter administering of electrolytes did not prevent changes in muscle characteristics after exposure to pre-slaughter stress. Holding birds at a maximum temperature (38 C) before slaughter produced meat with a lower water holding capacity, pH, cooking yield, and a higher shear value. In our case, the pH of meat from ORSS treated chickens gained slightly higher pH and lower in cooking loss values over the plain water groups, however, differences in values between ORSS and tap water was not statistically significant ($P > 0.05$).

The sensory attributes like odor/aroma, appearance, texture, taste, juiciness, and overall acceptability of steamed broiler meat samples were rated by consumer and untrained sensory panel using the 5-point hedonic scale. Husson & Pagès, (2003), the analyses of variance show that the two types of juries (trained and untrained) give similar sensory profiles and the few differences are mainly due to different ways of using the scale. Comparing the differences among the averages of the scores of different attributes it shows no significant effects by all levels of hour fasting (Table 5) having scores ranging from 3.53 to 4.33. However, the 0-h fasted has found highest in odor, appearance, and overall acceptability, while lowest in texture, taste, and juiciness equivalent to Contreras-Castillo, (2007) no differences in juiciness for the different FW periods, so this attribute did not interfere with the tenderness scores. Lyon, Smith, Lyon, & Savage, (2004), noticed that fasting did not alter the flavor attribute; nonetheless, meat from birds at 0 h fasting was darker and redder. The flavor was not tested in the entire study but it was observed darker and redder in appearance in 0-h fasting. Smith, Lyon, & Lyon, (2002) found that feed withdrawal produced lighter and less red broiler breast meat. Further, fillets from 8-h FWD birds had significantly higher L* values (lighter) whether cooked or uncooked and continued the trend of lighter fillets resulting from feed withdrawal stress.
The meat texture, taste, and juiciness of 48-h fasted chickens are of a similar trend wherein the better texture the samples are, the juicier and tastier they become. Diet and fasting significantly altered sensory texture (Lyon, Smith,

Lyon, & Savage, (2004). Having scores average ranging from 3.53 to 4.02, the presence of ORS did not manifest significant effects on all sensory attributes of broiler chicken meat over the tap water group in conformity with the findings of Schaefer, Murray, Tong, Jones, & Sather, (1993), both oral potassium and intramuscular magnesium aggravated subjective pork structure and texture scores but was found to improve muscle brightness and hue (higher b* value). The result reflected that ORSS treatment was brighter in color as it was scored higher values on appearance (3.80) over TW (3.75) Table 5. Testing on the interactions of these factors, the different levels of hour fasting versus drinking water showed significant interactions in terms of texture and overall acceptability. This then implies that the effect of levels hour fasting on texture and overall acceptability of steamed broiler meat is dependent on treatment in drinking water and vice versa. Figures 1 and 2 show the graphs of these interactions respectively. It can be argued that the comparability of all sensory profile scores may be attributed to the failure of untrained testers to use the scale correctly. Further study should be made on sensory of meat to be done by a trained panelist probably using the 9-point hedonic scale to clearly distinguish differences between sensations.

Overall findings in this proceedings disclosed that the ORSS treatment in pre-slaughter fasting did not alleviate or inhibit the adverse effect of feed withdrawal which aligned to the conclusions of Schaefer, Murray, Tong, Jones, & Sather, (1993), that oral potassium and intramuscular magnesium, as provided in the present study, had no advantageous impacts on pork quality but that the beneficial effects of Magnesium Aspartate on meat color and drip loss may warrant further investigation. In conclusion, the treatment of human Oral Rehydration Salt in during pre-slaughter fasting were all comparable to the effect of tap water except in water intake after feed fasting therefore not recommended. The study found the optimum feed withdrawal period of broiler whether in ORS or tap water before the slaughter could go as far as 48 hours with beneficial effects to the consumers but of monetary loss to poultry growers. Fasting within 24 hours or longer, the bird loses more live weight, liver, and empty gut-weight which are economically unfavorable to broiler raisers. Parameters on cooking loss and meat pH revealed that as the number of hours fasting increases, meat pH normalizes and cooking loss decreases which is an indicator of good quality meat sought after by broiler meat buyers. The comparable results of sensory and consumer's acceptability from acceptable to moderately acceptable levels of meat from broiler revealed that the odor, appearance, texture, taste, juiciness and overall acceptability from zero to 48 hours fasting in drinking water with ORS remain stable and acceptable to the consumers.

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Table 1. Total water intake before and after fasting

Treatment	Water Intake^{a}	Water Intake^{b}
Drinking water		
ORS	2051.83^{ns}	971.61^{b}
TW	1837.89^{ns}	807.38^{a}
Hour fasting		
0 hour	2450.25^{b}	0.00^{a}
24 Hours	1880.00^{a}	1676.16^{c}
48 Hours	1504.33^{a}	992.33^{b}

Legend: ^{a}Water intake before feed withdrawal, ^{b}Water intake after feed withdrawal

Values within the same column with the same superscript are not significantly different (*P*> 0.05)

^{ns} Not significant

Table 2. Daily water intake increment over 3 days before fasting and 48 hours after fasting

Treatment	Intake of Water				
	Daily Increment BFW			Daily reduction AFW	
	Day 1	Day 2	Day 3	24 -hr	48 - hr
Drinking water					
ORS	540.78^{ns}	732.94^{ns}	778.11^{ns}	209.00^{ns}	41.44^{ns}
TW	481.83^{ns}	636.27^{ns}	719.78^{ns}	196.11^{ns}	30.67^{ns}
Hour fasting					
0 hour	703.08^{b}	899.00^{b}	848.17^{b}	0.00^{a}	0.00^{a}
24 Hours	439.16^{a}	659.83^{a}	781.00^{b}	203.83^{b}	0.00^{a}
48 Hours	391.66^{a}	495.00^{a}	617.67^{a}	403.83^{c}	108.17^{b}

Values within the same column with the same superscript are not significantly different
^{ns} Not significant

Table 3. Live weight loss of broiler chicken

Treatment	Initial BW	Weight loss (g)		Weight loss (%)		Final weight
		24-hr	48-hr	24-hr	48-hr	
Drinking water						
ORS	1380.55^{ns}	77.77^{ns}	23.88^{b}	5.71^{b}	1.92^{ns}	1278.88^{ns}
Tap water	1378.33^{ns}	63.33^{ns}	19.44^{a}	4.78^{a}	1.67^{ns}	1295.55^{ns}
Hour fasting						
0 hour	1455.00^{ns}	0.00^{a}	0.00^{a}	0.00^{a}	0.00^{a}	1455.00^{b}
24 Hours	1369.16^{ns}	103.33^{b}	0.00^{a}	7.56^{b}	0.00^{a}	1265.83b^{a}
48 Hours	1314.16^{ns}	108.33^{b}	65.00^{b}	8.18^{b}	5.40^{b}	1140.83^{a}

Values within the same column with the same superscript are not significantly different
^{ns} Not significant

Table 4. Meat quality and carcass characteristics of broiler chicken breast meat

Parameters	Drinking water		Hour fasting		
	ORS	Tap water	0hr	24hr	48hr
Slaughter weight	1278.89^{ns}	1295.56^{ns}	1455.00^{b}	1265.83^{ba}	1140.83^{a}
Warm carcass weight	868.33^{ns}	898.05^{ns}	989.16^{b}	865.83^{ba}	794.58^{a}
Dressing percentage	55.49^{ns}	56.39^{ns}	55.54^{ns}	55.77^{ns}	56.52^{ns}
Liver weight	28.11^{ns}	26.00^{ns}	30.83^{b}	26.41^{a}	23.91^{a}
Gut weight (full)	157.62^{ns}	151.88^{ns}	185.58^{c}	154.50^{b}	124.16^{a}
Gut weight (empty)	136.55^{ns}	130.05^{ns}	152.08^{b}	136.25^{b}	111.58^{a}
Residual gut fill	21.05^{ns}	21.83^{ns}	33.50^{b}	18.25^{a}	12.58^{a}
Meat pH	6.16^{ns}	6.02^{ns}	5.94^{a}	6.09^{ab}	6.23^{b}
Cooking loss	47.35^{ns}	47.51^{ns}	49.38^{b}	47.38^{ba}	45.53^{a}

Values within the same row within the same group with the same superscript are not significantly different
^{ns} Not significant

Table 5. Summary of mean for sensory attributes of broiler chicken breast meat

Treatment	Odor	Appearance	Texture	Taste	Juiciness	Overall Acceptability
Drinking water						
ORS	4.02^{ns}	3.80^{ns}	3.73^{ns}	3.97^{ns}	3.83^{ns}	3.70^{ns}
Tap water	3.82^{ns}	3.75^{ns}	3.75^{ns}	3.56^{ns}	3.71^{ns}	3.53^{ns}
Hour fasting						
0-h	4.33^{ns}	3.83^{ns}	3.53^{ns}	3.76^{ns}	3.80^{ns}	3.73^{ns}
24-h	3.93^{ns}	3.83^{ns}	3.60^{ns}	4.02^{ns}	3.83^{ns}	3.53^{ns}
48-h	3.80^{ns}	3.73^{ns}	3.83^{ns}	4.20^{ns}	3.93^{ns}	3.60^{ns}

^{ns} Not significant

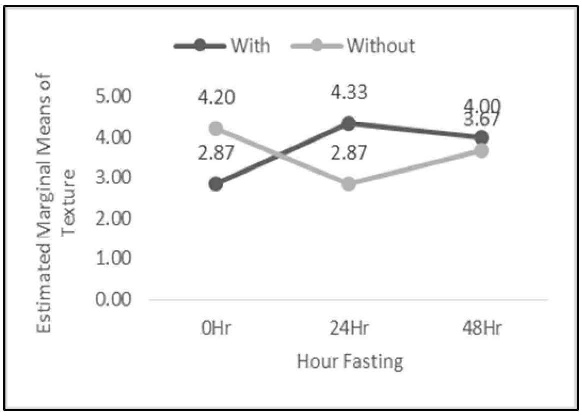

Figure 1. Levels of scores for meat texture

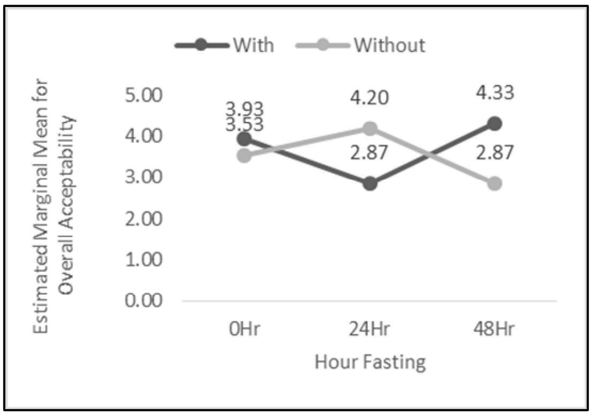

Figure 2. Levels of scores for overall acceptability