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Effects of Beak Amputation and Sex on the Pecking Rate Damage and Performance Parameters of Turkey

¹I.B. Allinson, ¹D.A. Ekunseitan, ¹A.A. Ayoola, ¹S.O. Iposu, ²O.M.O. Idowu,
²I.M. Ogunade and ¹S.O. Osho
¹Department of Animal Production and Health, ²Department of Animal Nutrition,
Federal University of Agriculture, PMB 2240, Abeokuta, Nigeria

Abstract: This study was carried out to evaluate the effect of sex and beak trimming on pecking and the performance of turkeys. Five hundred and forty unsexed, day old British United Turkey poults were divided into 3 treatments based on beak trimming at 0, 1/4, 1/3 measured from the tip of the beak inwards with 3 replicates of 60 poults each experiment 1 while 480 turkeys (240 each of male and female) were transferred and allotted to 4 treatment groups of 120 birds each and 4 replicates of 30 turkeys each in experiment 2. Data on performance response and severity of pecking were taken and subjected to one-way analysis of variance in a completely randomised design (experiment 1) and 2×2 factorial layout (factors were sex and beak trimming). Results showed that beak trimming had no significant ($p>0.05$) effect on all the performance parameters of turkey poults except feed intake while sex and beak trimming had significant ($p<0.05$) effect on performance indices of turkey. Debeaked male and female recorded higher feed intake, protein intake and feed conversion ratio. There was higher rate of aggressive pecking among the Toms than in the Hens and severity of damage was higher in undebeaked turkeys than the debeaked. Beak trimming can greatly reduce the severity of damage caused by aggressive pecking and should be done twice (6 and 14th week) at 1/4 measured from the tip of the beak.

Key words: Beak trimming, sex, turkeys, pecking rate damage, performance

INTRODUCTION

The domesticated birds of importance in the tropics include domestic fowls, the duck, goose, turkey, peafowl, Japanese quail, guinea fowl, pigeons and ostrich. However, in Nigeria, out of the five popular domesticated birds that is, chickens, duck, geese, guinea fowl and turkey, chicken is the most commonly reared (Omole *et al.*, 2006), whereas turkey production is put as uncommon compared to chicken in Nigeria. The uncommon rearing of turkey can be linked to the paucity of information on its production despite the benefits that can be derived from rearing the bird.

Sex is the major distinguishing factor between turkeys when it comes to their behaviour and performance characteristics (Martrenchar *et al.*, 2001). However, they have to attain certain age (12 weeks and above) before the sex determining features could manifest.

In the production of turkey, certain management practices are carried out in order to achieve optimum performance. These management practices include beak trimming/beak amputation, simply referred to as

debeaking, toe clipping, wing clipping, record keeping, deworming, cleaning and disinfecting of house, regular supply of quality feed and water and temperature regulation. Beak amputation is defined as removal of a portion of birds' beak; though causes temporary pain to individual birds but can be of much benefit to the welfare of the flock. It is done to reduce feed wastage and "cannibalistic" pecking.

The practice of beak trimming was introduced into poultry industry in an attempt to control feather pecking and cannibalism. Cannibalism is a distorted behaviour pattern in domestic fowl and game birds reared in captivity resulting from the abnormal restriction of the normal span of activities of a healthy, secure ranging bird. Birds kept in groups may sometimes develop unacceptable level of behavioural traits called vices, such as feather pulling and vent pecking which may result in cannibalism.

Beak trimming has been carried out routinely either on newly hatched poults in the hatchery or when they are a few days old. Precision machines are used for the operation. Outbreaks of feather pecking occasionally

occur with birds that have been debeaked at an early age and it is then necessary to beak-trim them again. Some recent evidences have shown that beak trimming does not decrease the tendency of birds to peck but it makes the pecking much less efficient and so reduces the damage caused (Blokhuis and Van der Haar, 1989).

Some welfare groups believe the beak amputation should be prohibited or at least not carried out routinely. The major opposition to beak amputation has been the observation that it may induce chronic pain through the formation of traumatic neuromas in the beak stump. Physiological and behavioural observations have provided indirect evidence that beak trimming of chickens causes pain in the stump of the beak that may persist for weeks or even months after the operation (Lee and Craig, 1991; Craig *et al.*, 1992).

Abiola (2007) confirmed that the severed nerves particularly regrow in the birds' beak after some time and that beak amputation has been estimated to reduce bird deaths from aggressive pecking by 25%. The present study was carried out to determine the effects of beak amputation and sex on the pecking rate damage and performance of starting and growing turkeys.

MATERIALS AND METHODS

Experimental site: The experiment was carried out at the turkey unit of Teaching and Research Farm Directorate, Federal University of Agriculture, Abeokuta, Ogun State, Nigeria. The area lies on latitude 7°10'N and longitude 3°2'E and located in the tropical rainforest vegetation zone with an average temperature of 34.7°C and relative humidity of 82%.

Experimental birds and management: A total of 540 unsexed, day old British United Turkey (BUT) poults was obtained and were managed intensively (deep litter) throughout the duration of the experiment. The poults were brooded for five weeks and fed pre-starter turkey mash, grower's mash at week 9 and finisher mash at week 13. After brooding stage, experiment one commenced with random allotment of the poults into treatment groups.

Experiment one: Experiment one commenced immediately after brooding. Poults were randomly allotted to 3 treatments groups of 180 poults each and 3 replicates of 60 poults each. Each treatment group with different beak trimming length.

Beak amputation: The beaks were amputated after brooding. The operation was performed in the evening to eliminate excessive bleeding. Battery operated debeaking

machine was used for the operation. Beaks of poult in treatment 1 were not amputated, treatment 2 had their beaks amputated 1/4 from the tip of the upper beak while 1/3 from the tip of the upper beak was amputated in treatment 3. Measurements were taken from the tip of the beak posteriorly. Vitamin K was administered in water two days before and three days after beak amputation. The feeding troughs were made of plastic feeding trays (for easy accessibility) for the poults and were placed randomly on the floor at the starter phase. As they grew larger in size, the feeding troughs were changed to a suspended type so as to avoid soiling of the feeds, reduce feed wastage and at the same time making accessibility to the feed possible for the poults. Duration of the first experiment was 14 weeks.

Experiment two: The second experiment commenced immediately after the end of experiment one, total of 480 turkeys (240 each of male and female) were transferred from the starting population and re-allotted to 4 treatment groups of 120 birds each and 4 replicates of 30 turkeys. The first group of toms were undebeaked while the second group of toms had their beak trimmed based on the preferred cutting length (as far as rate of regrowth and blood loss is concerned) from the beak trimming in experiment one (that is, 1/4 from the tip of the beak), group 3 consisted of undebeaked hens with final group comprising of hens trimmed at similar length as the toms. Only the upper beak was trimmed, with the use of battery operated debeaking machine.

Normal vaccination and medication programmes were adhered to. The birds were managed intensively with feed and water given *ad libitum* and other management practices carefully carried out. The duration of study was five weeks.

Experimental diets and chemical analysis: The diet varied according to the different developmental growth phases of the turkey poults, i.e., starter phase, grower phase and finisher phase. The feed formulations for the various phases are given in Table 1-3. The proximate composition of diets was determined using methods of AOAC (2000).

Performance indices: Feed intake and weight gain were determined weekly and recorded. Feed conversion ratio was computed on weekly basis in all phases of the study. Protein intake and Protein Efficiency Ratio were also determined under experiment two.

Qualitative parameters: The rate of damage caused by pecking was monitored among the female and male turkeys and observations were recorded based on the following criteria:

Table 1: Feed formulation for the turkey at starter phase (0-8 weeks)

Ingredients	Starter composition (%)
Maize	45.00
Full fat soya	15.00
Soya bean meal	25.00
Fish meal	7.30
Bone meal	4.50
Oyster	2.00
Salt	0.25
DL methionine	0.30
Lysine	0.10
*Vitamin min ⁻¹ premix	0.50
**TGI [®]	0.05
Total	100.00
Determined analysis	
Crude protein (%)	26.56
Crude fibre (%)	3.05
Ether extract (%)	5.41
Ash (%)	3.97
Calcium (%)	2.10
M.E (kcal kg ⁻¹)	2996.00
Phosphorus (%)	0.90

*Vitamin min⁻¹ premix contained: 9,000,000 IU of vitamin A, 2,135,000 IU of vitamin D3, 20,000 mg of vitamin E, 1,340 mg of vitamin B1, 5340 mg of vitamin B2, 1670 mg of vitamin K3, 12000 mg of pantothenate, 2670 mg of vitamin B6, 13.4 mcg of Niacin, 100 mg of Biotin, 1000 mg of Folic acid, 10,670 mg of Copper, 63,340 mg of Iron, 78,000 mg of Zinc, 1,17340 mg of Manganese, 775 mg of Iodine, 180 mg of Selenium and 10,000 mg of Antioxidant, **TGI[®]: Each KG contained; 14-16% MOS (naturally derived from extracts of yeast cell walls), Probiotic culture 100 billion CFU, *Lactobacillus acidophilus*, *Lactobacillus bulgaricus*, *Lactobacillus plantarum*, *Streptococcus faecium*, *Bifidobacterium bifidum*, *Candida rugosa*

Table 2: Feed formulation for the turkey at grower phase (9-12 weeks)

Ingredients	Composition (%)
Maize	48.00
Full fat soya	15.00
Soybean meal	22.00
Wheat offal	4.00
Fish meal	4.50
Bone meal	2.85
Oyster shell	2.50
Salt	0.25
DL methionine	0.20
Lysine	0.10
*Vitamin min ⁻¹ premix	0.50
**TGI [®]	0.10
Total	100.00
Determined analysis	
Crude protein (%)	24.30
Crude fibre (%)	3.36
Ether extract (%)	4.26
Ash (%)	3.81
Calcium (%)	1.92
Metabolizable energy (kcal kg ⁻¹)	3002.00
Phosphorus (%)	0.82

*Vitamin min⁻¹ premix contained; 9,000,000 IU of vitamin A, 2,135,000 IU of vitamin D3, 20,000 mg of vitamin E, 1,340 mg of vitamin B1, 5340 mg of vitamin B2, 1670 mg of vitamin K3, 12000 mg of Pantothenate, 2670 mg of vitamin B6, 13.4 mcg of Niacin, 100 mg of Biotin, 1000 mg of Folic acid, 10,670 mg of Copper, 63,340 mg of Iron, 78,000 mg of Zinc, 1,17340 mg of Manganese, 775 mg of Iodine, 180 mg of Selenium and 10,000 mg of Antioxidant, **TGI[®]: Each KG contained, 14-16% MOS (naturally derived from extracts of yeast cell walls), Probiotic culture 100 billion CFU, *Lactobacillus acidophilus*, *Lactobacillus bulgaricus*, *Lactobacillus plantarum*, *Streptococcus faecium*, *Bifidobacterium bifidum*, *Candida rugosa*

Table 3: Feed formulation for the turkey at finisher phase (13-16 weeks)

Ingredients	Composition (%)
Maize	50.00
Full fat soya	10.10
Soybean meal	14.00
Fish meal	1.50
Wheat offal	17.55
Bone meal	3.20
Oyster shell	2.50
Salt	0.25
DL methionine	0.20
Lysine	0.10
*Vitamin min ⁻¹ premix	0.50
**TGI [®]	0.10
Total	100.00
Determined analysis	
Crude protein (%)	19.20
Crude fibre (%)	4.05
Ether extract (%)	4.96
Ash (%)	3.88
Calcium (%)	1.74
Metabolizable energy (kcal kg ⁻¹)	3100.00
Phosphorus (%)	0.79

*Vitamin min⁻¹ premix contained; 9,000,000 IU of vitamin A, 2,135,000 IU of vitamin D3, 20,000 mg of vitamin E, 1,340 mg of vitamin B1, 5340 mg of vitamin B2, 1670 mg of vitamin K3, 12000 mg of Pantothenate, 2670 mg of vitamin B6, 13.4 mcg of Niacin, 100 mg of Biotin, 1000 mg of Folic acid, 10,670 mg of Copper, 63,340 mg of Iron, 78,000 mg of Zinc, 1,17340 mg of Manganese, 775 mg of Iodine, 180 mg of Selenium and 10,000 mg of Antioxidant, **TGI[®]: Each KG contained, 14-16% MOS (naturally derived from extracts of yeast cell walls), Probiotic culture 100 billion CFU, *Lactobacillus acidophilus*, *Lactobacillus bulgaricus*, *Lactobacillus plantarum*, *Streptococcus faecium*, *Bifidobacterium bifidum*, *Candida rugosa*

- Mild = Non aggressive pecking
 Less severe = Aggressive pecking without injury
 Severe = Aggressive pecking with injury but does not lead to death
 Very severe = Aggressive pecking leading to death

There was more occurrence of aggressive pecking when the males were newly brought together for the second experiment and during feeding.

Statistical analysis: Data obtained in experiment 1 were subjected to a one-way analysis of variance in completely randomised design while data obtained in experiment 2 were subjected to 2×2 factorial arrangement in a Completely Randomised Design. Significant differences among treatment means were determined using Duncan Multiple Range Test (Duncan, 1955) as contained in SAS (SAS/STAT, 2010) package.

RESULTS

Effect of Beak trimming on the performance of Turkey

Poult: Table 4 presents the results of the effect of beak trimming on the performance of turkey poults. It was observed that beak trimming had no significant ($p > 0.05$)

influence on most parameters considered except on feed intake ($p < 0.05$). Feed intake was highest and comparable in birds whose beaks were trimmed at 1/4 and 1/3, respectively with the least intake observed in the control group.

Effect of sex and beak trimming on the performance of finisher Turkey (experiment two): Table 5 presents the main effect of sex and beak trimming on the performance of finisher turkeys (turkeys above 16 weeks of age). The result revealed that the final weight, weight gain and protein efficiency ratio were significantly ($p < 0.05$) influenced by beak trimming. Male turkeys had best values for final weight, weight gain and feed conversion ratio compared to values obtained in female. Undebeaked turkeys had better indices for weight gain and Feed Conversion Ratio (FCR) with debeaked turkeys having a comparable feed intake but with a poor FCR.

Table 4: Effect of beak trimming on the performance of turkey pouls (experiment 1)

Parameters	Beak trimming			SEM
	0	1/4	1/3	
Initial weight (kg bird ⁻¹)	1.05	1.05	1.17	0.03
Final weight (kg bird ⁻¹)	6.54	7.04	6.65	0.64
Weight gain (kg bird ⁻¹)	5.49	5.99	5.48	0.64
Feed intake (kg bird ⁻¹)	26.24 ^b	28.24 ^a	27.94 ^a	0.62
Feed conversion ratio	4.78	4.72	5.10	0.18

Means on the same row having different superscripts are significantly different ($p < 0.05$)

Table 5: Main effect of sex and beak trimming on the performance of finisher turkey (experiment two)

Parameters	Sex			Beak trimming		
	Male	Female	SEM	Debeaked	Undebeaked	SEM
Initial weight (kg bird ⁻¹)	6.940	5.4700	1.50	6.230	6.180	0.140
Final weight (kg bird ⁻¹)	10.250 ^a	6.9000 ^b	1.68	8.290 ^b	8.860 ^a	0.280
Weight gained (kg/bird/day)	0.095 ^a	0.0410 ^b	0.03	0.059 ^b	0.077 ^a	0.010
Feed intake (kg bird ⁻¹)	0.677 ^a	0.5980 ^b	0.04	0.662	0.613	0.050
FCR	7.313 ^b	21.122 ^a	6.91	18.916	9.519	6.320
Protein intake (kg bird ⁻¹)	0.170 ^a	0.1500 ^b	0.01	0.160	0.150	0.012
PER	0.580 ^a	0.2700 ^b	0.00	0.350 ^b	0.500 ^a	0.060

Means on the same row (for each factor) having different superscripts are significantly different ($p < 0.05$)

Table 6: Details of interaction between sex and beak trimming on the performance of finisher turkey (experiment two)

Beak trimming parameters	Sex	Debeaked	Undebeaked	SEM
	Female	5.38 ^b	5.57 ^b	
Final weight (g)	Male	10.00 ^a	10.50 ^a	0.66
	Female	6.59 ^b	7.21 ^b	
Weight gained (kg/bird/day)	Male	0.84 ^a	0.11 ^d	0.01
	Female	0.35 ^c	0.47 ^b	
Feed intake (g/bird/day)	Male	0.71 ^a	0.64 ^b	0.03
	Female	0.61 ^b	0.58 ^b	
Protein intake (kg bird ⁻¹)	Male	0.17	0.16	0.07
	Female	0.15	0.14	
Protein efficiency ratio	Male	0.48 ^a	0.67 ^a	0.08
	Female	0.22 ^c	0.32 ^{b,c}	
Feed conversion ratio	Male	8.59 ^b	6.04 ^b	4.80
	Female	29.25 ^a	12.99 ^b	

Means on the same row having different superscripts are significantly different ($p < 0.05$)

Details of interaction between sex and beak trimming on the performance of finisher Turkey: The details of interaction of sex and beak trimming on the performance of finisher turkey Table 6 revealed significant ($p < 0.05$) effect on the final weight, weight gain, feed intake, protein efficiency ratio and feed conversion ratio of turkey. There is interaction effect in weight gain, the value recorded for weight gain (0.84 kg bird⁻¹), was higher in males than in the female, whereas the weight gain recorded for undebeaked female (0.47 kg/bird/day) was higher than what was recorded for the undebeaked male turkey (0.11 kg/bird/day). Feed intake (0.71 kg bird⁻¹) and protein intake (0.17 kg/bird) were highest for males that were beak trimmed while females that were debeaked recorded the highest value for feed conversion ratio (29.25), whereas, no significant ($p > 0.05$) difference between undebeaked male and undebeaked female under feed intake. The mortality recorded was the same for females and males that were beak trimmed as well as for undebeaked females.

Influence of sex and beak trimming on the rate of damage caused by aggressive pecking in finisher turkey:

There was a very high rate of fighting and aggressive pecking in treatment 1 consisting of undebeaked male turkeys as shown in Table 7. This behaviour led to series of injuries in the vent, nose and wings at the end of five weeks of the experiment. The highest damage rate was recorded in this treatment. However, minimal rate of

Table 7: Influence of sex and beak trimming on the rate of damage caused by aggressive pecking in finisher Turkey

Treatments	Pecking rate damage				
	Week 1	Week 2	Week 3	Week 4	Week 5
T1 (male undbk)	Severe	Severe	Severe	Very severe	Severe
T2 (male dbk)	Less severe	Less severe	Less severe	Less severe	Less severe
T3 (female undbk)	Less severe	Severe	Severe	Less severe	Mild
T4 (female dbk)	Less severe	Less severe	Mild	Mild	Mild

Mild: Non aggressive pecking, Less severe: Aggressive pecking without injury, Severe: Aggressive pecking with injury but does not lead to death and Very severe: Aggressive pecking leading to death

damage though aggressive pecking was witnessed in treatment 2 but it was less destructive due to the trimmed beak of the males constituting the treatment. The level of damage recorded in treatment 3 was not as severe as that recorded in treatment 1 and 2. There was no case of injury reported in treatment 4 consisting of debeaked hens.

DISCUSSION

The findings of the first experiment conducted in this study formed the basis of the second experiment, where its purpose was better appreciated. Examining the effect of different length of beak trimming on the performance of turkey poults in experiment one, it was discovered that the poults whose beak were trimmed at 1/4 from the tip of the beak recorded the best value for all performance indices measured. This indicated that birds in this treatment had no difficulty in picking up the feed particles, thus the increase in feed intake. This also validate the findings of Onifade (1995) and Bolarinwa (1998) that for efficient growth rate, then, feed intake must correspondingly increased with anticipated growth rate of animal.

The lower feed intake recorded in the undebeaked turkeys could be as a result of overgrowth of the upper beak which in turn makes it uneasy to pick the feed particles. Also, the rate of regrowth of the beak was noticed to be rapid in treatment 2 than in treatment 1, though the regrowth rate was not keenly monitored in this study but in order to reduce the possibility of pain due to deep cutting of the beak (Appleby *et al.*, 2004), it was advisable to re-cut after regrowth might have occurred than to cut too deep at once. By so doing the welfare of the poults must have been put into consideration (Blokhuys and Van der Haar, 1989). Hence, the cutting length used in treatment two of experiment 1 was recommended for use in experiment 2.

This study also revealed that, sex greatly influenced the weight of turkeys. The highest final weight (10.50 kg bird⁻¹) was recorded in the untrimmed male turkey while the highest final weight of was recorded for undebeaked female. This affirms the report of Ferket (2004) that toms are usually heavier in weight and larger in size than the hens of the same age. In this study, feed intake in toms was observed to be higher than in the

hens and this could be related to sex as reported by Omole *et al.* (2006). Similar explanation goes for the high weight gain recorded in the male turkey compared to female turkeys.

There were notable positive influences of beak trimming on the performance and welfare of the turkeys (Ensminger, 1992). As indicated in the details of interaction between sex and beak trimming on the performance of finisher turkey, it was revealed that the debeaked male turkey recorded higher weight gain, feed intake, protein intake compared to undebeaked toms which recorded lower value for the indices considered but with a better feed conversion ratio. The high protein intake in the debeaked turkeys could be traced to the more protein requirement for the regrowth of the beak tissue that was trimmed. The debeaked hens also recorded a higher feed intake (0.61 kg bird⁻¹), protein intake (0.15 kg bird⁻¹) and feed conversion ratio (29.25) while the undebeaked females recorded lower feed intake (0.58 kg bird⁻¹), protein intake (0.14 kg bird⁻¹) and feed conversion ratio (12.99), though final weight of 10.50 kg bird⁻¹ in undebeaked male and 7.21 kg bird⁻¹ in undebeaked female turkeys appears to be higher. Weight gain in undebeaked hens also shows a higher value of 0.47 kg bird⁻¹, indicating that the hens were more negatively influenced by debeaking than the toms which performed better.

Findings of this study revealed that there was a very high rate of fighting and aggressive pecking in group of undebeaked male turkeys which supports the findings of Hocking *et al.* (1999) that higher aggression in male turkeys was common than in female turkeys. This behaviour led to series of injuries in the vent, nose and wings at the end of week 5 of the experiment. The highest damage rate was recorded in this group. However, minimal rate of damage though aggressive pecking was witnessed in treatment 2 due to the trimmed beak of the males constituting the group.

CONCLUSION

Beak trimming had no significant influence on the performance of turkey poults except for the feed intake. High feed intake (28.24 kg bird⁻¹) recorded for turkeys

that were debeaked at 1/4 from the tip of the beak indicated that the debeaked turkey poults from that treatment (treatment two), had no difficulty in feeding after debeaking. The rate of aggressive pecking resulting into various kind of injury on the nose, beak, wings and vent in the male turkeys, were greatly reduced by beak trimming. Male turkeys kept together in the same confinement were liable to frequent fighting than females kept together in the same confinement. Therefore beak trimming could be done twice for turkeys, first at the age of 5-6 weeks and later when they are about 14-16 weeks also the beak should not be cut more than 1/4 from the tip of the beak, so as to reduce pain and possibility of blood loss. This management practice is capable of decreasing pecking rate or cannibalistic tendency usually experienced in birds kept in groups particularly on deep litter managed birds.

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