VIRGIN BIRTH IN FOUR STRAINS OF TURKEYS REARED IN NIGERIAN

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Abstract
The study undertook to study the occurrence of parthenogenesis in four (4) strains of turkeys reared in Nigeria. The four strains comprised 1 exotic strain (White Nicholas) and 3 local strains (White, black and silver plumage colours). A total of forty (40) pre-pubertal hens consisting of 10 White Nicholas hens, 10 White Local hens, 10 Silver Local hens and 10 Black Local hens were used for the study. The study commenced with egg laying in those hens. Eggs from uninseminated virgin hens were collected and checked for the occurrence of parthenogenesis. Twenty-five eggs from each treatment were incubated. Embryonic mortalities at candling were determined by the presence of blood ring following egg breakout or as detected at candling. The positive developing eggs were allowed to hatch. The results of the study showed that only the White and Black Local hens showed signs of parthenogenesis with only the White Local strain having 12% fertility and hatchability values and the Black Local strain having 4% fertility and 0% hatchability values. It was concluded that strain differences with respect to parthenogenesis exist and that selection for parthenogenesis should be carried out in White and Black Local strains to help minimize losses arising due to embryonic mortalities in those strains. Therefore, an intending turkey farmer should wait for parthenogenesis to phase out in these two strains before natural mating or artificial insemination should set in to minimize the rates of embryonic mortalities in their fertile eggs.
Keywords: Parthenogenesis, plumage colour, strain, blood ring, turkeys

Introduction

Turkeys commonly reared in developing countries can be classified by their genotype or plumage colours (Thears, 2007). Several plumage colours of turkey genotype exists which include black, bronze, brown, red and white (Schoger, 1964) with black, bronze and white predominantly existing in the tropical environment (Okoro, *et al.,* 2012). Commercial turkey production in Nigeria is still rudimentary. The reason for this apparent low production seems to be lack of appreciation of its potential role in animal protein generation (Abeke and Ubani, 2008). For instance, one average sized turkey (8 kg body weight) is equivalent to 4 average sized broilers (2 kg each). Nevertheless, the full potentials in turkey cannot be harnessed until we come to terms with their reproductive capacity. For instance, turkeys have a myriad of reproductive problems ranging from infertility to management problems which include dearth of reliable data on management/reproductive potentials of indigenous local strains. The reproductive problems include unsuccessful natural mating due to size differences between toms and hens, parthenogenesis (a major cause of infertility in flocks), decreased libido due to difficulty in improving reproductive characteristics alongside growth parameters, decrease in fertility within a breeding season partly due to genetic incompatibility, nutrition, disease, stress (King *et al.*, 2000; Rosales, 2013) and other unknown factors.
Parthenogenesis from the Greek word parthenos, meaning "virgin", and genesis, meaning "creation" is a natural form of asexual reproduction in which growth and development of embryos occur without fertilization. Parthenogenesis occurs very rarely birds (Scott, 1996).
Parthenogenesis, development from an unfertilized oocyte, has been documented in turkeys (Olsen and Marsden, 1954). Olsen (1960) reviewed much of his older work and concluded that 32.4% of infertile turkey eggs normally underwent parthenogenesis, but the embryos died very early in most of these eggs. The incidence of parthenogenesis can be increased by inoculation of the hens with live Fowl Pox Virus and Newcastle Disease Virus (Olsen and Buss, 1967). Olsen (1972) in his later works recorded the incidence of parthenogenesis in different strains of turkeys, which reached the highest level at 49%. Parthenogenesis is responsible for some infertility in turkeys (Rosales, 2013).

Karl (2015) noted that Olsen's continued selection for increased incidence of parthenogenesis resulted in almost half of unfertilized eggs showing some development and some 8% percent of the embryos (200) hatched in the final year of selection, all were males. All of the parthenogenetic males were indistinguishable from males produced by natural or artificial mating and were capable of natural mating or producing semen for artificial inseminations. Research has shown that turkey parthenotes start as haploids, they then become diploid due to inhibition of cell division or cell fusion. In birds, females are the heterogametic sex (ZW) and males are the homogametic sex (ZZ), this is the opposite of mammals. WW parthenotes would not develop as this condition is not viable.

Parthenogenesis in turkeys is an accidental form of parthenogenesis which is erroneously believed to be a form of facultative parthenogenesis and it appears to result from a conversion of haploid cells to diploid (Revazova *et al.*, 2007); most embryos produced in this way die early in development. Rarely, viable birds result from this process, and the rate at which this occurs in turkeys can be increased by selective breeding (Revazova *et al.*, 2008), however male turkeys produced from parthenogenesis exhibit smaller testes and reduced fertility (Williams, 2007).

In turkey production, toms, which are product of parthenogenesis, are preferred to hens as they are more efficient converters of feed to meat. Nevertheless, since parthenogenesis is not an adaptive feature and poses a threat to fertility, the study therefore sought to investigate the occurrence of parthenogenesis in White Nicholas, Black, White and Bronze local hens, its management problems and ways of mitigating such problems.

Materials and Methods

The study was conducted at the Poultry Unit of the Department of Animal Science Teaching and Research Farm, University of Nigeria, Nsukka. The four strains of turkeys used for the study were composed of 1 Exotic strain (White Nicholas) and 3 Local strains (the Black, White and Silver plumage colour types). A total of sixty female poults comprising 15 each of the above named strains were used for the study. The poults were procured at day old from Bachelor Farms at Ibadan for the White Nicholas and Obassanjo Farms at Ogun State for the Black, White and Silver local poults. The poults were housed together in well-ventilated netted pens. All the animals were fed 5% of their body weights throughout the experimental period and water was given *ad libitum*. The poults were fed commercial diets of chick starter mash from day old to ten (10) weeks old, chick finisher mash from ten weeks old to twenty-four weeks of age and chick layers mash for the remaining parts of the study. Prior to lay, 40 birds (10 from each strain) were separated according to varieties by placing them two (2) per pen to minimize fighting. Eggs from uninseminated virgin hens in each of the treatments were collected and checked for the occurrence of parthenogenesis. Twenty-five (25) eggs from each treatment were incubated. Candling was done at 7 days after setting and embryonic mortalities at this stage was detected by the presence of blood ring following egg breakout or detected at candling as described by Thomas (2008). The positive developing eggs were allowed to hatch.

Data collected were reported using percentage occurrences.

Results and Discussion

The result on parthenogenesis in four strains of turkeys is presented in Table 1 and the values are graphically represented in Fig. 1.

Table 1: Parthenogenesis in four strains of turkey hens

Parameters/Strains	WN	Black	White	Silver
Fertility (%)	0	4	12	0
Hatchability (%)	0	0	12	0
Embryonic Mortality (%)	0	4	0	0

WN=White Nicholas

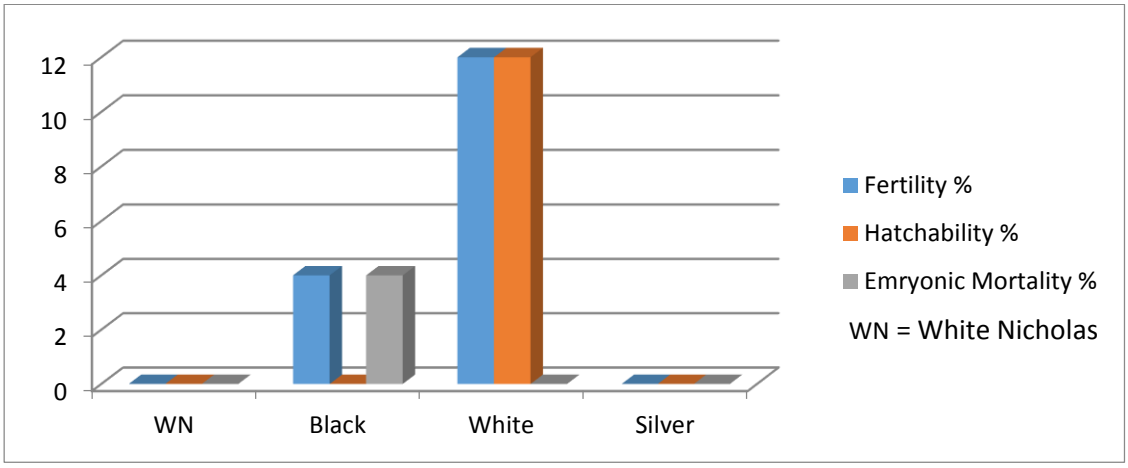

Fig. 1: Parthenogenesis in four strains of turkey hens

The fertility values ranged from 0-12% in all the strains studied with the highest value of 12% recorded in White Local hens and the lowest value of 0% recorded in WN and Silver hens. The hatchability values ranged from 0-12% with the highest value of 12% recorded in White Local hens while 0% was recorded in WN, Black and Silver hens. The embryonic mortality values ranged from 0-4% with the highest value of 4% recorded in Black local hens whereas 0% was recorded in WN, Whit Locale and Silver Local hens.

The high fertility and hatchability values noticed in only the White local hens may suggest the fact that they are descendants of the Bestville Small Whites in which Olsen and Marsden (1954) detected the first incidence of parthenogenesis in turkeys. However, the result on fertility in this strain without selection for this trait shows that they are better in terms of parthenogenesis than their presumed ancestors for which the above researchers recorded 8% with selection for parthenogenesis. Their reports on embryonic mortality in which out of 32.4% cases of parthenogenesis, most of the embryos died very early in most of the eggs shows that the White local strains are better in terms of parthenogenesis as 0% embryonic mortality was recorded in them. It shows that with selection, the White local turkeys may do better than the Bestville Small Whites, and parthenogenesis, if well managed, can become an asset. Rosales (2013) identified parthenogenesis to be the major cause of infertility in turkey hens. The later findings of this research on duration of fertility (not included here) revealed that parthenogenetic hens (White and Black local hens) had higher incidences of embryonic mortalities following insemination with single dose of semen and not higher infertility rates. Therefore, a farmer using White and Black local hens for breeding purpose should embrace parthenogenesis at the onset of the breeding season to generate only male turkeys which are of more economic value to the farmer and then switch to normal breeding when parhthenogenesis phases out. The rate of occurrence of parthenogenesis in White and Black local strains should be improved using selection and other methods locally available to the farmer to help minimize losses arising due to embryonic mortalities in them.

The 4% fertility and 4% embryonic mortality in Black local hens show that they have potentials for parthenogenesis and may be improved upon by selection.

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