

Intake of Some Biological Seeds and Root Extracts of Plants Improves Fertility and Hatchability of Turkey Eggs

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Abstract: An experiment was conducted to determine the fertility and hatchability of eggs laid by Turkey hens fed extracts of okra seed, pumpkin seed and guava root powder for 8 weeks. Twenty four, 32 weeks old turkeys (4 toms and 20 hens) were randomly selected and allotted into four treatment groups; T₁ (No extract or feed supplementation); T₂ (50 ml okra seeds extracts/ litre of water); T₃ (50 ml guava root extract/ litre of water) and T₄ (50 g pumpkin seed powder/kg of feed). Turkey hens were subjected to artificial insemination and eggs laid in the period were collected and determined for fertility and hatchability. Total and weekly egg production of hens was higher ($P < 0.05$) in T₂ and T₄ groups of birds. The number of fertile eggs, early, middle and late dead embryo was better ($P < 0.05$) for the same groups of birds compared to other treatments. Egg hatchability percentage of hens in T₂ and T₄ groups were markedly improved and higher ($P < 0.05$) than those in T₁ and T₃ groups. Fertility and hatchability of eggs in T₁ and T₃ were similar ($P > 0.05$). The findings concluded that feeding okra and pumpkin seed extracts to breeder turkey hens can improve the fertility and hatchability of the eggs.

Keywords: Okra seed, guava root, pumpkin seed, potency, antioxidants, spermatozoa.

INTRODUCTION

The practice of using synthetic hormones as stimulators of reproductive performance in farm animals have been questioned in many quarters because of its negative cumulative effect in animal products meant for consumption and human health [1, 2]. Alternative measures now recommended for facilitating reproductive efficiency of animals is the application of organic extract of plants like leaves, seeds, stem and roots [1, 3, 4]. These plant materials contain great amount of beneficial phytochemicals, anti-oxidants, vitamins and minerals which are known to increase growth and stimulate reproduction in humans and animals [5, 6]. Plant extracts contain high amounts of calcium, copper, iron, magnesium, zinc and phosphorus [7].

Extracts of plants have been used as natural feed additives and have generally been proven to be effective and non-toxic when consumed by humans and animals. In humans, extracts of different parts of pumpkin (*Cucurbita pepo* [8], guava (*Psidium guajava*) [9] and okra (*Hibiscus esculentus*) [10] are used as medicinal remedies. For instance, [11] documented the use of extracts of pumpkin plant for prevention and treatment of prostrate ailment and impotence in man. In animals, little information available on the use of these plant extracts showed its potential in improving sperm

morphology in goats [12]. The present study was aimed at evaluating the impact of feeding okra seed (*Hibiscus esculentus*), pumpkin seed (*Cucurbita pepo*) extracts and guava root (*Psidium guajava*) powder to Breeder turkey hens on egg fertility and hatchability.

MATERIALS AND METHODS

The experiment was carried out at the Poultry Unit of Department of Animal Science, Ebonyi State University, Abakaliki, Ebonyi State, Nigeria.

Collection and Preparation of Extracts of Okra Seed, Guava Root, and Pumpkin Seed

Okra Seed Extract

Fifty grams (50 g) of dry okra seed purchased from the local market in Abakaliki, Ebonyi state was washed and soaked in a litre of water for 24 hours under room temperature of 25 °C. After 24 hours, the soaked okra seeds were then sieved and the supernatant was stored in a refrigerator maintained at 5 °C and later used daily as Okra seed extract (OSE).

Guava Root Extract

Guava root were harvested from an established guava plantation within Abakaliki, Ebonyi State, Nigeria. For each preparation, 1kg of guava roots were cut into smaller pieces and soaked in 5 litres of water for 5 days under room temperature (25 °C). Later the soaked guava roots were then sieved and the supernatant collected was stored in a refrigerator maintained at 5 °C. The supernatant was fed as guava root extract (GRE).

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Pumpkin Seeds

Pumpkin fruits purchased from the local market in Abakiliki, Ebonyi State were cut and the seeds extracted. The extracted seeds were toasted for about 15 minutes using an electric burner and then minced into powder form. This was used as pumpkin seed supplement (PSS). Fifty gram (50 g) of the powder mixed in 1kg of commercial breeders feed was made available to hens in treatment 4 *ad-libitum*. The protocols for sample preparation for each treatment were repeated weekly in order to ensure the availability of fresh samples of the extracts and supplement.

Experimental Birds and Management

Twenty four turkeys (4 toms and 20 hens) of thirty two (32) weeks of age and selected from an existing population of turkey birds in the poultry farm of the institution, were randomly assigned to four experimental treatments (T) in a completely randomized design (CRD). Each experimental treatment was made up of five Turkey hens housed singly in cages having 2.5 square foot spacing per hen. Bird in a treatment served as replicate. Birds in T₁ received no extract and served as the control. Turkey hens in T₂ were administered daily, 50 ml of OSE mixed in 1 litre of water whereas hens in T₃ received daily, 50ml of GRE mixed in 1 litre of drinking water. Turkey hens in T₄ received 50 g of PSS mixed in 1 kg commercial breeder feed daily. The turkey toms were also housed in single cages. Feed and water were supplied *ad-libitum* where appropriate while other standard management procedures for Breeder turkeys were followed throughout the study.

Semen Collection and Artificial Insemination of Hens

Semen samples for artificial insemination were collected from the 4 turkey toms between 1600 and 1800 hour by the massage technique [13]. The procedure was modified to enable collection with open tubes. One operator held the turkey tom in the left hand at the shanks with its tail positioned towards the assistant. The lumbar area of the bird was massaged several times, with each massage beginning at the base of the neck and extending beyond the tail. Less pressure was applied around the base of the tail and cloacae. The massage was done repeatedly until the copulatory organ protruded through the cloaca. The bird was milked by applying pressure with the thumb and index finger around the cloaca to avert the phallus

and semen was expressed. The assistant collected the milked semen in a calibrated test tube. Ejaculate from each tom was screened in the laboratory to ascertain its quality.

Physical evaluation involved the determination of ejaculate volume, progressive sperm motility, spermatozoa concentration, total spermatozoa and percentage normal spermatozoa in ejaculate as described by [14, 15]. Detailed descriptions of the procedure have been documented [16]. Insemination of hens was done immediately after collection using pooled undiluted semen of the toms. Turkey hens in each treatment were inseminated with 0.03ml of pooled semen of toms three times a week on Monday, Wednesday and Friday. Insemination was done using a syringe and with the aid of a personnel assistant.

Data Collection

After insemination, eggs laid by hens in each treatment group were collected daily for determination of its fertility and hatchability indices. The number of eggs laid daily by birds in each treatment was recorded and the sperm fertility rates (ratio of fertilized eggs at candling to incubated eggs x 100) per treatment were determined during incubation. Other egg fertility indices determined in each treatment included early -, middle - and late - dead - in - shell eggs. The latter was determined respectively by candling on days 14th, 19th and 24th days of incubation. The hatchability percentage was determined by the ratio of the number of chicks hatched to the total number of eggs set in the incubator multiplied by 100.

Statistical Analysis

Data was analyzed using one-way analysis of variance (ANOVA) in accordance with a completely randomized design (CRD) using computer statistical package [17]. Significant differences in the treatment means were separated using Duncan's procedure and accepted at 5 or 1% level of probability.

RESULTS

The ejaculate characteristics of turkey toms used for artificial insemination of the hens are shown Table 1.

Average pooled semen volume, progressive sperm motility, sperm concentration, total and normal spermatozoa in ejaculates of the toms were 0.21ml, 90.52%, 12.05 x10⁶/ml, 2.44 x10⁶ and 93.88%, respectively. Ejaculates of the four turkey toms did not

Table 1: Ejaculate Characteristics of Toms Used for Artificial Insemination of Hens

Parameters	Experimental turkey toms				Pooled
	Tom 1	Tom 2	Tom 3	Tom 4	
Semen volume (ml)	0.19±0.01	0.22±0.01	0.18±0.01	0.23±0.02	0.21±0.01
Sperm motility (%)	89.61±1.25	94.14±1.08	85.75±1.32	93.50±0.95	90.52±1.13
Sperm concentration (x10 ⁶ /ml)	10.52±0.17	14.19±1.11	9.96±0.86	13.50±0.71	12.05±0.72
Total sperm (x10 ⁶)	2.00± 0.01	3.05 ± 0.83	1.84±0.05	2.85± 0.31	2.44±0.32
Normal sperm (%)	92.74±0.82	94.71±0.34	94.32±0.41	93.69±0.80	93.88±0.59

differ ($P > 0.05$) in these parameters hence they were pooled.

The fertility and hatchability characteristics of eggs of turkey hens fed different plant extracts are presented in Table 2. Results showed significant ($P < 0.05$) variations in all egg fertility indices measured among treatments. Higher total number of eggs and percentage of fertile eggs were observed in hen fed OSE (T₂) and PSS (T₄) compared ($P < 0.05$) to other treatments. Percentages of early and late dead-in-shell embryos were significantly ($P < 0.05$) lower in the same groups of birds. Also, turkey hens fed OSE and GRE (T₃) recorded higher number of middle dead-in-shell embryos. The total number of egg per treatment, percentage of fertile eggs and middle dead-in-shell embryos recorded for turkey hens in control (T₁- no extract supplementation) and GRE groups were similar ($P > 0.05$). Results of the hatchability rate (%) of eggs set for each treatment showed significant differences ($P < 0.05$) with higher egg hatchability witnessed in eggs of turkey hens fed OSE and PSS.

DISCUSSION

The ejaculate characteristics of turkey toms showed that the toms were reproductively active and as a result voided semen that were of good quality. This was because, results of the physical evaluation of ejaculates of the toms - semen volume, progressive sperm motility, spermatozoa concentration, total number of sperm cells in ejaculate and percentage of normal spermatozoa in ejaculates, were within ranges reported for normal turkey toms [18, 19]. A marked improvement in the number of eggs laid and the percentage of fertile egg at candling was observed in hens treated with OSE and PSS indicating possible improvement in the reproductive rate of the birds. This result supports the reports of [3] and [20] that plants can produce phytochemicals with sex-enhancing potency and with the ability to stimulating high reproductive potential in animals. Extracts of okra seed and pumpkin seed functions as antioxidant and contains high amount of minerals like calcium, iron, zinc, magnesium and phosphorus that has the ability to stimulate sperm cells and enhance fertility in birds [7,

Table 2: Fertility Rate and Hatchability Percentage of Eggs Laid by Turkey Hens Treated with Different Plant Extracts

Parameters	Treatment groups			
	T ₁	T ₂	T ₃	T ₄
<i>Egg fertility indices (%)</i>				
Total Eggs (No.)	36±2.56 ^b	61±2.60 ^a	39±2.90 ^b	54±2.24 ^a
Fertile eggs (%)	50±2.14 ^b	87±3.18 ^a	51±3.10 ^b	94±3.36 ^a
Early dead embryo (%)	17±1.04 ^a	11±1.41 ^b	20±1.51 ^a	11.5±2.30 ^b
Middle dead embryo (%)	11±1.61 ^b	18±1.37 ^a	15±1.05 ^a	13.5±1.67 ^b
Late dead embryo (%)	50±2.36 ^a	20±1.68 ^b	40±2.06 ^a	25±1.64 ^b
<i>Egg Hatchability (%)</i>	22±1.31 ^b	51±2.52 ^a	25±1.05 ^b	50±3.21 ^a

^{a,b}Means with different superscripts in a row were significantly ($P < 0.05$) different; T₁ = control; T₂ = hens treated with okra seed extract; T₃ = hens treated with guava root extract; T₄ = hens treated with pumpkin seed extract.

21]. Although there appear not to be any report on the effect of pumpkin seed extracts on fertility in female, however, in the male rat, pumpkin seed extracts have been reported to effectively control prostate gland enlargement [11] reported that pumpkin seed oil can inhibit testosterone-induced hyperplasia of the prostate and therefore may be beneficial in the management of benign prostatic hyperplasia. In goats, pumpkin extract positively enhanced spermatozoa morphology [12]. Reduced number of early and late dead-in-shell embryos were observed in eggs of hens fed OSE and PSS whereas up to 50 and 40% late dead-in-shell embryos respectively, was shown in eggs of turkey hens in the control and GRE treatment groups. The probable reason for the high embryo mortality witnessed in the latter groups of hen eggs still remains to be understood. It may be inferred that some phytochemical agents inherent in OSE and PSS extracts which exerts some level of protection to turkey egg embryo during incubation were apparently absent in eggs of hens in control and GRE groups. This result necessitates an apparent need to carry out further investigation to determine the biochemical constituents of extracts of these biological plant materials. The percentage egg hatchability of OSE and PSS treated groups of hens were within the range of 27 to 67% reported in literature for domestic turkeys [22]. The low egg hatchability rate of eggs of hens in control and GRE groups could be ascribed to the absence of embryo-sustaining phytochemicals and minerals like zinc needed for the sustenance of the egg embryo during incubation. One of the causes of low fertility and hatchability of poultry eggs is nutrient deficiency and the presence of anti-nutritional factors in diet. Insufficient nutrients like vitamins A, B, D, E, folic acids and minerals like zinc and selenium in egg could cause embryo mortality. Also, [23] report on causes of embryo mortality noted that the modification of fatty acid composition of the egg yolk due to low ratio of unsaturated and saturated fatty acids leads to mortality of egg embryo. The extracts may contain some factors that modify the fatty acid composition of the egg yolk thereby increasing its ratio in the egg yolk. Based on the present findings, it was concluded that feeding okra and pumpkin seed extracts as applied in this study to breeder turkey hens improved the fertility and hatchability of the eggs.

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