POTENTIALS OF EGG-YOLK CITRATE EXTENDER SUPPLEMENTED WITH AQUEOUS GARLIC EXTRACTS FOR POULTRY ARTIFICIAL INSEMINATION

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Abstract

An experiment was designed to harness the potential of aqueous fresh and dried garlic extracts supplement in egg yolk extender for rooster semen to improve fertility and hatchability of egg. Aqueous extract of fresh and dry garlic were obtained and supplemented into egg-yolk citrate extender at different inclusion levels ranging from 0% to 6% and unextended semen (control). A total of 20 Marshal roosters and 160 hens of 40 wks old were used for the experiment. The ejaculate pool of the marshal roosters was collected and pooled, divided into eight equal parts and randomly allotted to the treatment groups, the extenders were diluted with the semen in ratio 2:1. The hens were inseminated with the constituted extenders for three weeks and eggs were collected for the period of two weeks. The eggs were assessed for fertility and hatchability. The result of fertility of hens inseminated with egg yolk-aqueous dry garlic extracts extended semen showed that treatments 7 (5%) compare favourably with treatment 1 (unextended) with highest fertility percentage value of 80.0%. Aqueous fresh garlic extract inclusions of 2% and 6% had apparently better percentage values compare to unextended treatment. Inclusion of aqueous fresh garlic extracts at 6% in egg-yolk extenders, and 5% inclusion of aqueous dry garlic extract to egg yolk extender are recommended as an extender in roosters' semen extension.

Introduction

The increasing use of artificial insemination (AI) in the poultry industry emphasizes the need for the distribution of good quality sperm cells. In order for the poultry industry to take advantage of modern AI techniques, proper storage of poultry semen is necessary. Chicken semen is characterized by low volume and high concentration, several factors play a role in maintaining the quality of semen before use. The diluents used for semen extension and storage conditions such as time, aeration, and holding temperature play a major role (**Dumpala *et al.*, 2006**).

Garlic has been reported to possess tremendous health benefit and mitigate free radical accumlations. The property of garlic has been accredited to its antioxidant action (Yang *et al.*, 1993). The most common method of increasing poultry semen volume is by adding appropriate diluents to retain their viability *in-vivo*. Comparison of diluted and undiluted stored semen showed that applying extenders is necessary to sustain good-quality sperm (Bilgili *et al.*, 1987). Antioxidant play an important role in scavenging free radicals which otherwise may cause lipid peroxidation of sperm membrane (Baumber *et al.*, 2000). An extender must contain an antioxidant source to offer protection against lipid peroxidation. This experiment examines the potentials of aqueous extracts of fresh and dry garlic in egg-yolk citrate extender on fertility of hen artificially inseminated.

Materials and Methods

The fresh and dried garlic was purchased and the clove and bulb were separated, the garlic was crushed separately with blender. 40g of fresh and dried garlic sample were soaked with distilled water at ratio 1:4 Garlic to water for three days and was decanted, the filtrate was obtained from the residues.

20 roosters and 180 hens were purchased from a reputable breeding farm in Oyo State and were housed in battery cage containing one (1) rooster per cell and two (2) hens per cell. The birds were managed based on breeders' recommendations. Semen collection was carried out according to the modified semen collection procedure as outlined in Balogun *et al.* (2015), two times a week throughout the study. Care was taken to avoid any contamination of semen with cloacal products such as faeces. After which semen was harvested twice a week and ejaculate was taken to the laboratory for *in-vitro* analysis.

160 marshal pullets were randomly allotted to experimental groups, 5 replicates per treatment, 10 birds per treatment in a random manner. Fresh laid eggs were collected and shell sterilized with alcohol. The eggs were broken and separated into yolk and albumen portions. The extender

composition includes sodium citrate 1.9g, egg yolk 20mls, fructose 1.0g and distilled water 80mls.

Semen pool of roosters divided into 8 equal parts and allotted their respective extenders in a completely randomized design. The treatments were diluted with the constituted extenders in ratio 1:2. For each of dry and fresh garlic extract their inclusion levels were 1% (T3), 2% (T4), 3% (T5), 4% (T6), 5% (T7) and 6% (T8) of egg yolk citrate, Unextended Semen (T1) and Egg Yolk citrate Extender (0%, T2)

The hen insemination took place immediately after the assessment of semen quality. Each hen was everted and semen was deposited into the intra vagina of the hen through the use of tuberculine syringe in which tubular glass rod is attached to its mouth with the aid of rubber cork. The hens were inseminated twice every week in the evening for a period of 3 weeks. And the insemination doses were 0.05ml per hen. Eggs were collected for two weeks after the first week of insemination. Eggs collected were assessed for fertility and hatchability. Data obtained were subjected to descriptive statistics.

Results

The trend of result showed that inclusion of aqueous fresh garlic extracts to egg yolk citrate enhanced the fertility of eggs. The result revealed that the treatment 4, (2% inclusion) had the highest fertility of 83.9%, while inclusion of different levels of aqueous fresh garlic extract based extender had higher fertility values than ordinary egg-yolk extender, except for treatment 5 and 6 (3 and 4% inclusion). Aqueous fresh garlic extract inclusions of 2% and 6% had apparently better percentage values compare to unextended. The percentage hatchability of fertile eggs of hen inseminated ,with aqueous fresh garlic extract extended semen showed treatment 2 had the highest percentage value of 100.0, while treatments 5 and 6 recorded 91.67 and 90% respectively. The percentage hatchability of hen inseminated with aqueous fresh garlic extract extended semen showed that Treatment 5 had the highest percentage hatchability of 88.0%.

The result of fertility of hens inseminated with egg yolk-aqueous dry garlic extracts extended semen showed that treatments 7 (5%) compare favourably with treatment 1 (unextended) with highest fertility percentage value of 80.0. The hatchability record of fertile egg sets of hens inseminated with aqueous dry garlic extracts extended semen revealed that treatment 2 and 6 had 100.0%, which was followed by treatments 8, 7, 3, 1, 5 and 4 with values of 93.3%, 91.67%, 88.24%, 87.5%,84.62% and 80.0% respectively. The result of hatchability of eggs set of hens inseminated with egg-yolk aqueous dry garlic extract extended semen revealed that treatment 7 had the highest value of 73.3, although treatment 1 had a close hatchability value of 70.0% which was followed by treatment 8, 3, 6, 2, 5 and 4 with values of 66.7%, 62.5%, 55.6%, 45.8% and 42.1% respectively.

Discussion

The diluents used in poultry semen should be properly constituted and be evenly screened of any ingredient that may be deleterious to the maintenance and survival of the sperm cells, and adjudge not to hinder fertility. Impressively, the fertilizing ability of aqueous fresh garlic extracts extended semen was better than unextended and 0% inclusions at 6% inclusion, and similarly 5% of aqueous dry garlic inclusion had overall performance better than unextended and pure egg yolk based extender. This is a good indication that aqueous garlic at 5 and 6% in dry and fresh garlic forms respectively, can performed optimally in extension of poultry semen for artificial insemination which could positively result into an encouraging fertilizing ability by the breeders hen. Donoghue and Donoghue (1997) pointed out that antioxidant activity in seminal plasma and sperm is not high enough to prevent lipid peroxide damage after extension and *in vitro* storage, and that supplemental antioxidants could improve semen shelf life. Garlic inhibits lipid peroxidation, reducing ischemic/reperfusion damage and inhibiting oxidative modification of LDL, thus protecting endothelial cells from the injury by the oxidized molecules (Borek, 2001). However, phytochemicals from plant–rich diets, including garlic, provide important additional protection against oxidant damage (Borek, 1997).

Interestingly, some of the treatments in the two garlic extracts formulated extenders performed comparable and above the unextended semen in percentage fertility, this can be observed in treatments 4 and 8 for aqueous fresh garlic based extended semen and treatment 7 for aqueous dry garlic based extended semen. The performance of garlic based extenders could be attributed to the antioxidant abilities of this two garlic extracts formulated extenders. Expectedly the hatchability of inseminated egg sets was also favourable for the two formulated extenders across the treatments and still partially follows the same pattern as exhibited for fertility. It a normal phenomenon to experience better hatchability subsequently following fertility provided candling is properly carried out.

Conclusion

It is therefore conclusive that fortification of egg yolk citrate extender with aqueous extracts of fresh and dry garlic enhances the fertility and hatchability of pullet eggs

Inclusion of aqueous fresh garlic extracts at 6% in egg-yolk extenders, and 5% inclusion of aqueous dry garlic extract to egg yolk extender are recommended as an extender in roosters' semen extension which can give a better fertility and subsequently good hatchability results. Poultry breeding farms should therefore endeavor to employ the use of aqueous garlic extracts as a supplement in their egg-yolk citrate extenders.

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Table 1: fertility and hatchability of eggs as influenced by aqueous garlic fortification in egg yolk extender in rooster semen

	Unextended	Egg yolk extender	Egg yolk-Garlic inclusion				
	T1	T2	T3 (1%)	T4 (2%)	T5 (3%)	T6 (4%)	T7 (5%)	T8 (6%)
			Aqueous extract of Fresh garlic					
% Hatchability	100	81.25	80.77	91.67	90	88.25	85.71
Hatchability of egg set%	55.56	61.90	67.74	88	40.91	68.18	70.59
Fertility%	55.60	76.20	83.90	56.00	45.50	77.30	83.30
			Aqueous extract of Dry garlic				
% Hatchability	100.00	88.24	80.00	84.62	100.00	91.67	93.33
Hatchability of egg set %	55.56	62.50	42.11	45.83	60.00	73.33	66.67
Fertility%	55.60	70.80	52.60	54.30	60.00	80.00	71.40