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Transcutaneous Ultrasonography: a new method to study characteristics of Ovarian Follicles in Duck

S. Jeyakumar[1*], A. Kundu, Kuntola roy[1], T. Sujatha[1] ,Jai Sunder[1]

[1]Division of Animal Science, Central Agricultural Research Institute,Port Blair - 744101, Andaman and Nicobar Islands, India

Abstract

In poultry, ovarian morphology of parent has got major positive effect on egg production and laying sequence. So far, limited reports are available regarding application of ultrasonography to evaluate ovarian status of chicken but no such published reports are available on duck. This preliminary study was undertaken to describe the ovarian and follicular characteristics in laying duck using non-invasive transcutaneous ultrasound method. The ultrasonographic examinations were done using a real time B Mode portable ultrasound scanner [SA-600V (Medison Co. Ltd., Korea)] fitted with a 6.5 MHz micro convex array triple frequency transcutaneous probe. The follicles appeared as clusters or as single large follicle depending upon the position of the transducer. The cluster of large yellow follicle (LYF) appeared as dark circles or ovals with light to bright hyperechoic concentric rings and narrow white borders indicating the follicle wall. Sonographically follicles could be classified into four categories based on its diameter. The average diameter (mm) of preovulatory, large, medium and small was 41.75±1.75 (n=2), 32.29±0.99 (n=7), 27.00±1.19 (n=4) and 13.90±1.54 (n=5). It is concluded that ultrasonography could be employed as a potential non-invasive tool to study ovarian follicular status in ducks.

Keywords: Ultrasonography, Ovarian ,Duck

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INTRODUCTION

In poultry, ovarian morphology of parent has got major positive effect on egg production and laying sequence. In breeding programme of poultry, selection at genetic level for growth and egg yield brings out the maximum potential of parent stock and thus the real success of the programme. Reproductive fitness / ovarian morphology of parent has got major positive effect on egg production and laying sequence (Hocking et al., 1987; Hocking, 1993). In ducks determination of ovarian morphology is limited in that it is terminal, and thus, lifelong egg production can only be inferred. Improvements in ultrasound technology now make it possible to observe ovarian condition in vivo, thereby allowing for repeated sampling of the same bird over an entire egg production cycle. Although ultrasonography in animal reproduction has proved to be a useful diagnostic tool for veterinary practitioners and researchers in reproductive biology and animal science, however, incase of ducks the use of ultrasonography has not yet been extensively explored. Therefore, this preliminary study describes the ovarian and follicular characteristics in laying duck using non-invasive transcutaneous ultrasound method.

MATERIALS AND METHODS

A real time B Mode portable ultrasound scanner [SA-600V (Medison Co. Ltd., Korea)] fitted with a 6.5 MHz micro convex array triple frequency transcutaneous probe was used for ovarian scanning. The desired images were frozen and hard copy was obtained using thermal printer (Sony). Ultrasound examinations were performed in Khaki Campbell ducks (n=10) after immobilizing each duck by placing it in right lateral recumbency and legs were restrained by an assistant. Ultrasound transmission gel was applied to the surface of the transducer and was directly placed over the defeathered skin area between the rib cage and thigh. The region over the ovary was scanned and the transducer was swept in the entire area once a follicle has been located. Individual follicles observed during the study were measured by using calibrated measurement functions of the ultrasound machine.

Address for correspondence*

S. JEYAKUMAR

Division of Animal Science, Central Agricultural Research Institute,Port Blair - 744101, Andaman and Nicobar Islands, India

E-mail: drsjeyakumar@rediffmail.com

RESULTS AND DISCUSSION

The appearance of active ovaries was characterized by the presence of follicles in different sizes representing various stage of development. The study revealed that the average no. of follicles observed per bird was (mean±se) 1.8±0.3 (n=18). The follicles appeared as clusters or as single large follicle depending upon the ovarian activity and position of the transducer. Once concentric circles in the centre of the follicle were viewed, the follicle was measured. Developing follicles were first seen as round areas with an indistinct, anechoic or hypoechoic inner structure. The cluster of large yellow follicle (LYF) appeared as dark circles or ovals with light to bright hyperechoic concentric rings and narrow white borders indicating the follicle wall (Fig.1). Sonographically follicles could be classified based on the size (range, mm) into four categories viz. preovulatory (40-43.5), large (30-37.5), medium (23.5-28.5) and small (10.5-18 5) (Fig.2, 3, 4). Average diameter (Mean± S.E., mm) of the follicles under each category was 41.75±1.75, 32.29±0.99, 27.00±1.19 and 13.90±1.54. During the present study 2 nos of preovulatory, 7 nos. of large, 4 nos. of medium and 5 nos of small follicles were observed.

The results of the present study demonstrate that transcutaneous ultrasonography of the reproductive organs in mature female breeding duck is very feasible and provides a non invasive technique that can easily be performed on the farm compared to the endovaginal panoramic radial transducer used by Melnychuk et al. (2002) in poultry. Similar findings on sonographic characteristics of follicles were reported by Hofbauer and Krautwald-Junghanns (1998) in birds, Bronneberg and Taverne (2003) in Ostriches and Jeyakumar et al. (2010) in Nicobari hen. This technique allows the visualization of different

Fig 1: Cluster of hierarchical yellow follicles
Fig 2: Preovulatory Follicle with layers of concentric rings
Fig 3: Large Yellow Follicle
Fig 4: Small yellow follicle

morphological structures of the ovary viz. different sizes of small, medium, large and pre ovulatory follicles. As shown in the Fig 2 different follicles appeared with hyperechoic layers of concentric rings which were produced when the sound wave emitted from the transducer were perpendicular to the fullest part of the follicle (Jeyakumar et al., 2010). These ring structures were also detected during ultrasonography study of chicken (Cartee et al., 1992), Ostriches (Bronneberg and Taverne, 2003) and in Nicobari hen (Jeyakumar et al., 2010). Through ultrasound analysis, it is possible to identify those birds that have an overabundance of LYF and multiple hierarchies. Many studies have shown that an abundance of LYF commonly results in a multiple hierarchy arrangement (Hocking et al., 1987; Yu et al., 1992 and Robinson et al., 1995). Thus the ability to count follicles in vivo is valuable in predicting the potential for multiple hierarchies.

CONCLUSION

In summary, the transcutaneous ultrasonography proves to be a useful diagnostic tool to monitor ovarian activity and also to detect any reproductive pathologies. Further, it may assist in future development and application of reproductive technologies such as artificial insemination, especially regarding the right timing of insemination. This also suggests that the selection of nonproductive females within breeding groups should become possible, which would certainly contribute to a more cost efficient venture.

REFERENCES

BRONNEBERG RGG, TAVERNE MAM Ultrasonography of the female reproductive organs in farmed ostriches (Struthio camelus spp.). Theriogenology, 2003; 60: 617-633.

CARTEE RE, RUMPH PF, ROLAND , STEELE DE. Ultrasonographically detectable ring structure in avian (Gallus gallus) egg yolks. Anatomia, Histologia,. Embryologia, 1992; 21: 57-64.

HOCKING PM. Effects of body weight at sexual maturity and the degree and age of restriction during rearing on the ovarian follicular hierarchy of broiler breeder females. British Poultry Science, 1993; 34: 793-801.

HOCKING PM, GILBERT AB, WALKER MA, WADDINGTON D. Ovarian follicular structure of White Leghorns fed ad libitum and dwarf and normal broilers fed ad libitum or restricted to point of lay. British Poultry Science, 1987; 28: 493-506.

HOFBAUER H, KRAUTWALD-JUNGHANNS ME. Transcutaneous ultrasonography of the avian urogenital tract. Veterinary Radiology and Ultrasound,1999; 40: 58-64.

JEYAKUMAR S, SUJATHA T, KUNDU A. Ultrasonographic characteristics of ovarian follicles in Nicobari hen. Indian Veterinary Journal, 2010; 87: 295-296.

MELNYCHUK VL, COOPER MW, KIRBY JD, RORIE RW, ANTHONY NB. Use of ultrasonography to characterize ovarian status in chicken. Poultry Science, 2002; 81: 892-895.

ROBINSON FE, ROBINSON NA, HARDIN RT, WiILSON JL. Effects of 20-week body weight and feed allocation during early lay on growth, carcass composition and reproductive performance of female broiler breeders. The Journal of Applied Poultry Research, 1995; 4: 203-210.

YU MW, ROBINSON FE, CHARLES RG, WEINGARDT R. Effect of feed allowance during rearing and breeding on female broiler breeders. 2. Ovarian morphology and production. Poultry Science, 1992; 71: 1750-1761.