EFFECT OF PULSED ELECTRO MAGNETIC FIELD (PEMF) EXPOSURE ON HATCHABILITY PERFORMANCE OF JAPANESE QUAIL HATCHING EGGS

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ABSTRACT

A study was conducted to analyze the hatchability performance of Japanese quail breeder hatching eggs at Poultry Research Station, Tamil Nadu Veterinary and Animal Sciences University (TANUVAS), Chennai – 51. A total of 33792 Japanese quail breeder hatching eggs with 6 settings were divided in to four equal groups of each 8448 eggs as T1, T2, T3 (Treatment group) and T4 (Control group). The treatment groups hatching eggs viz, T1,T2 and T3 were exposed to PEMF at 1 Hz frequency with 1500 nT intensity for 18, 12 and 6 hours respectively at 18^{0}C and 80 per cent relative humidity. The control eggs were stored at the same temperature and humidity but kept unexposed to the PEMF. After bringing into room temperature for one hour, the eggs were incubated under optimum temperature and humidity in setter and hatcher. The total and fertile hatchability performance showed highly significant ($P \leq 0.01$) difference between treatment and control groups. There were significant differences ($P \leq 0.05$) observed for mean per cent embryonic mortality, mean per cent dead in germ and dead in shell between treatment and control group. Mean per cent fertility did not show any significant difference between treatments and control group. This study concluded that PEMF exposure could be a useful tool to improve the hatching performance of Japanese quail.

INTRODUCTION

Interaction of Pulsed Electro Magnetic Field (PEMF) with life processes has attracted the attention of biologists in recent years, specially, from the point of view of their implication in space sciences. It is known that under certain conditions static or DC magnetic fields do interact with certain life processes both on long-term and short-term exposures. In recent years, several studies have been reported on the effects of PEMF on the life processes of the organism (Narayan *et al*., 1984) to a point where it has now generated considerable interest. However few attempts have been made to assess the effects of PEMF exposure on crop yield, productivity and seed viability (MIM, 2002). The use of very low electromagnetic fields has been proved useful in laboratory treatment of a wide range of therapeutic situations like fractures, irregular bone cracks, migraine and repair of degenerated nerves (Hulme *et al.,* 2002). The present study is a part of a series of on-going investigations on the poultry birds being attempted to determine the effect of low frequency and ultra low intensity PEMF exposure on hatchability performance. It is possible that exposure of Japanese quail breeder hatching eggs to PEMF of optimum frequency, intensity and duration may have beneficial effects. If any increase in the hatchability performance is observed after exposing to PEMF, the same will promise a major thrust to the poultry industry.

MATERIALS AND METHODS

This study was conducted to analyze the hatchability performance of Japanese quail breeder hatching eggs at Poultry Research Station, Tamil Nadu Veterinary and Animal Sciences University (TANUVAS), Chennai-51. A total of 33792 Japanese quail breeder hatching eggs with 6 settings were divided in to four equal groups of each 8448 eggs as T1, T2, T3 (Treatment group) and T4 (Control group). The treatment groups hatching eggs viz, T1,T2 and T3 were exposed to PEMF

at 1 Hz frequency with 1500 nT intensity for 18, 12 and 6 hours respectively at 18^0C and 80 per cent relative humidity. The control eggs were stored at the same temperature and humidity but kept unexposed to the PEMF. After bringing into room temperature for one hour, the eggs were incubated under optimum temperature and humidity in setter and hatcher. The frequency of fluctuating electromagnetic fields around power transmission cable is 50 Hz, whereas the varying frequency of pulse electromagnetic fields approaches human and animal physiology frequency of 1Hz, or is a static magnetic field, hence the trials has been initiated with above combination (MIM, 2012). The eggs were transferred on 15^{th} day to hatcher and chicks were pulled out on 18^{th} day. Unhatched eggs were break-opened to get infertile and embryonic mortality data. The per cent hatchability on total and fertile eggs set and embryonic mortality were worked out. The data were statistically analyzed using standard statistical procedure.

Equipment

The Controlled Magnetic Field (CMF) enclosure was used to generate the pulsed electromagnetic fields. The CMF enclosure consists of coil system formed by a cubic lattice consisting of 5 square loops each of them is of 120 cm on the side, all of them are connected in "series –aiding" configuration mounted co-planar and co-axial. The spacing between the loops and the variable numbers of turns of wire in each loop are pre-determined so as to obtain the largest volume of most uniform (or homogeneous) magnetic fields for a given physical dimension. The coil assemblies, designed and fabricated at Madras Institute of Magnetobiology are carefully calibrated using high precision magnetometers and current measuring devices in the magnetic standardization lab of the institute.

RESULTS AND DISCUSSION

The mean percent hatchability on total and fertile egg set and embryonic mortality are presented in Table.

Hatchability performance (%)

The total and fertile hatchability performance showed highly significant ($P \leq 0.01$) difference between treatment and control groups. Mean per cent hatchability on both total and fertile egg set observed in our study were similar with Thanaseelan *et al.* (2000), who reported an average total hatchability of 80 per cent in control and 81 per cent in treatment group and a fertile hatchability of 85.10 per cent in control and 86.17 per cent in treatment groups when the eggs were exposed in electromagnetic fields for 2 hours per day for 3 days.

Embryonic mortality (%)

There were significant differences ($P \leq 0.05$) observed for mean per cent embryonic mortality, mean per cent dead in germ and dead in shell between treatment and control group. This finding on embryonic mortality percentages was better with Thanaseelan *et al* (2000), who reported a maximum embryonic mortality of 12.5 per cent in control and 14.58 per cent in treatment groups in chicken hatching eggs and observed no significant difference between treatment and control groups.

CONCLUSSION

It can be concluded from the above study that the Japanese quail hatching eggs exposed to PEMF at 1 Hz frequency with 1500 nT intensity for 18 hours showed significant effect on hatchability percentage. The results of this study provide enough indication that it is imperative to conduct a few more trials using a different combination of frequency, intensity and dose duration to get better hatchability performance.

Table : Effect of pulsed electromagnetic fields on hatchability performance of Japanese quail breeder hatching eggs during pre incubation storage. (Mean±SE)

S.No	Parameters (Per cent)	PEMF Exposure on Pre incubation storage			
		1 Hz frequency with 1500 nT intensity			Control
		T1 (18 Hrs)	T2 (12 Hrs)	T3 (6 Hrs)	
1	Hatchability to total eggs set **	62.81^{a}±2.05	59.15^{b}±1.37	56.79^{b}±1.16	54.09^{c}±0.91
2	Hatchability to fertile eggs set **	77.22^{a}±2.43	73.23^{b}±1.18	70.43^{b}±1.16	67.69^{c}±2.12
3	Dead Germ*	12.32^{c}±0.78	14.84^{b}±0.35	16.37^{b}±0.36	16.91^{a}±0.25
4	Dead in Shell*	11.29^{c}±1.25	11.92^{b}±0.87	12.71^{b}±0.67	15.44^{a}±1.62
3	Total embryonic Mortality *	23.62^{c}±2.9	26.76^{b}±1.18	29.09^{b}±0.89	32.36^{a}±2.15
4	Fertility NS	81.33±0.42	80.79±0.69	80.61±0.46	80.09±1.12

Means bearing different superscript in the same row differ significantly

*** Highly significant (P<0.01); Significant *(P<0.05)*

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