The influence of an artificial sound stimulation on the chicken hatching from incubated eggs with the variant of weight

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Der Einfluß von künstlicher Beschallung auf das Schlüpfen von Küken aus Bruteiern verschiedener Gewichtsklassen

1. Introduction

Beakclapping is the first instinct that birds show. The number of sound signals produced by birds at beakclapping has been exactly determined. The problems of the application of a sound stimulation of the bird embryos was discussed by several authors (IMPEKOVEN, 1971; VINCE and FRANCES, 1980; OCKLEFORD and VINCE, 1985; GLAZEV, 1990; VETERÁNY et al., 1998). The usual way of stimulation was to use the tape recorders with recorded signal of mothers calling her youngs for food or the sounds of the youngs themselves. Some experiments showed that the youngs from the sound stimulated embryos beakclap from the eggs faster and their yolk sac gets absorbed faster as well, which decreases the number of infectious diseases (SLIŠKOVSKAJA, 1984).

The relationship between the weight of set eggs and their suitability for hatching was discussed by several authors (CARENKO et al., 1978; NOVÁK, 1986; ROBINSON, 1991; WILSON, 1991; ASUSQUO and OKON, 1993; UPRETI et al., 1993; BURKE, 1994; ZGLOBICA and WEZYK, 1995). POLYANICHKIN and VOROKOV (1992) claim that for an incubation of the Hampshire breed set eggs the use of eggs of an average weight of 60.5 g is the most effective.

The aim of the work was to determine what weight of the Hampshire breed set eggs would be best suitable for an artificial sound stimulation, using the sound produced by an electronic generator during incubation.

2. Material and methods

In the work the Hampshire breed set eggs of the parental brood aged 32–49 weeks were used. The set eggs were divided according to their weight into four groups: the weight of

Zusammenfassung

Die Arbeit untersucht den Einfluß einer künstlichen Beschallung auf Hühnerembryos der Rasse Hampshire in Abhängigkeit vom Gewicht der eingesetzten Bruteier. Für die Beschallung wurde ein elektronischer Tongenerator verwendet, der einen Ton mit 5,7 Hz und einer Lautstärke von 10 dB bzw. 20 dB erzeugte. Die Lautsprecher wurden am 19. Tag der Bebrütung im Brutkasten installiert. Die eingesetzten Bruteier wurden nach ihrem Gewicht in vier Gruppen geteilt: Gruppe 1: 55–56 g; Gruppe 2: 57–58 g; Gruppe 3: 59–60 g und Gruppe 4: 61–62 g. In den Kontrollgruppen werden die Eier ohne Beschallung bebrütet; in den Versuchsgruppen waren Lautsprecher asymmetrisch an der Seite des Brutapparates angebracht. Die Beschallung erreicht die besten Ergebnisse in Versuchsgruppe 3: Beginn des Schnabelpickens nach 493,9 + 6,771 Stunden (bei einer Lautstärke von 10 dB) bzw. 489,5 + 4,648 Stunden (bei einer Lautstärke von 20 dB); für die gesamte Gruppe dauerte das Schnabelpicken 10,6 + 0,663 Stunden und zeigte so signifikante Unterschiede zur entsprechenden Kontrollgruppe. Die Lautstärke hatte weder einen signifikanten Einfluß auf den Beginn des Schnabelpickens oder dessen Dauer noch auf den Schlüpfzeitpunkt. Die Resultate zeigen, daß für die Beschallung von Hampshire Bruteiern das günstigste Gewicht zwischen 59 und 60 g liegt.

Schlagworte: Schlüpfen, Beschallung, Eigewicht, Hühner.

Summary

In the work the influence of an artificial sound stimulation on the Hampshire breed chicken embryo, in dependence on the set eggs weight, was studied. For stimulation, an electronic sound generator with intensity of the stimulating sound 10 dB and 20 dB and the frequency of 5.7 Hz was used. Loudspeakers were placed into hatcheries on the 19th day of incubation. The set eggs were divided according to their weight into four groups: the weight of the incubated eggs in the first control and experimental groups ranged from 55 to 56 g; in the second control and experimental groups it ranged from 57 to 58 g; in the third control and experimental groups it ranged from 59 to 60 g; and in the fourth control and experimental groups the weight ranged from 61 to 62 g. In the control groups the set eggs were hatched without sound stimulation; in the experimental groups loudspeakers of an acoustic transducer of sound with the variant intensity of the stimulating sound for 10 and 20 dB and the frequency interval of 5.7 Hz were placed asymmetrically at the incubators sides. When using the sound stimulation on chicken embryo, the best results were achieved in the third experimental group (59 – 60 g) in which the results were as follows: beginning of beakclapping in 493.90 ± 6.771 hours (with intensity of the stimulating sound for 10 dB) and in 489.50 ± 4.648 hours (with intensity of the stimulating sound for 20 dB); the whole group beakclapping time was 10.60 ± 0.663 hours showing thus significant difference of results, if compared with the third control group (table 2). The variable of intensity did not have any significant influence on the beginning of beakclapping, on the whole group beakclapping time as well as on the hatching time. The results show that the most suitable weight for a sound stimulation of the Hampshire breed set eggs is 59–60 g.

Key words: hatching, sound stimulation, weight of eggs, chicken.

the incubated eggs in the first control and experimental groups ranged from 55 to 56 g; in the second control and experimental groups it ranged from 57 to 58 g; in the third control and experimental groups it ranged from 59 to 60 g; and in the fourth control and experimental groups the weight ranged from 61 to 62 g. In each group there were 90 eggs, and the total number of tested eggs was 1440 (720 eggs were tested with the intensity of the stimulating sound for 20 dB and frequency 5.7 Hz, and 720 eggs were tested with the intensity of the stimulating sound for 10 dB and frequency 5.7 Hz). The set eggs were hatched in the hatcheries of BIOS MONO 06 type. In two incubators, control groups without sound stimulation were hatched. Experimental groups (with sound stimulation) were hatched in two weight categories in one incubator. In the first incubator the eggs with weight of 55–56 g and 57–58 g were hatched; in the second incubator the set eggs with weight of 59–60 g and 61–62 g were hatched. In both incubators sound with the intensity of the stimulating sound for 20 dB was applied. In the third incubator there were incubated eggs with weight of 55–56 g and 57–58 g; and in the fourth incubator there were eggs with weight of 59–60 g and 61–62 g. The set eggs in these two incubators were stimulated by sound with the intensity of the stimulating sound 10 dB. Loudspeakers of acoustic transducer of sound with frequency of 5.7 Hz were placed into the incubators asymmetrically at the sides of the incubators on the 19th day of incubation, while the set eggs were placed on the opposite end of the incubator.

During hatching, following traits were observed in 30–minutes intervals: beginning of beakclapping, the whole group beakclapping time, the whole group hatching time and embryonic mortality (after the 19th day of incubation). Every time that the experiment was repeated the beginning time of the beakclapping of every set egg was recorded. The final beakclapping time of individual groups in every repeated experiment was given as an average value of actually measured times. As the beginning of beakclapping we determined the time when the chicken broke the shell with the beak. The beginning of beakclapping was estimated visually through a glass peephole placed on the upper cover of every incubator.

During the first eighteen days the temperature in the incubator was 37.8–38.0 °C and the air humidity 50–60 %. From the nineteenth day on the temperature in the incubator was 37.6–37.8 °C and the air humidity 65–90 %.

The experiment was repeated five successive times in the following way: in two incubators the set eggs were not sound stimulated, in two incubators the set eggs were stimulated by the sound of 10 dB and the frequency of 5.7 Hz, and in two incubators the set eggs were stimulated by the sound of 20 dB and the frequency of 5.7 Hz. Thus it follows

that every time six incubators were used in the experiment. From the arrived at results the basic variable – statistic traits were calculated, and the observed differences were tested by a Student's test.

3. Results and discussion

The final results of experiments with sound stimulation with the intensity of the stimulating sound for 10 dB and frequency 5.7 Hz (table 1) show that chicken began to beakclap first after 493.90 ± 6.771 hours of incubation in the third experimental group in which eggs with the weight 59–60 g were incubated. In this group the shortest whole group beakclapping time (10.60 ± 0.663 hours) was observed. This time was statistically significant ($P < 0.05$) in comparison with the third control group, as well as the shortest whole group hatching time (504.20 ± 7.380 hours). The whole group beakclapping time of all experimental groups stimulated by sound was shorter in comparison with the corresponding control groups.

The results of experiments during which chicken embryo were stimulated by sound from the acoustic transducer with intensity of the stimulating sound for 20 dB and frequency 5.7 Hz are showed in table 2. In the third experimental group of set eggs with weight of 59–60g, chicken began to beakclap first after 489.50 ± 4.648 hours. In this group the shortest whole group hatching time(500.80 ± 5.154 hours) was observed. This time was statistically significant ($P < 0.05$) in comparison with the corresponding control group. The shortest beakclapping time was needed in the fourth experimental group (11.10 ± 0.860 hours). The whole group hatching time was shorter in all experimental groups (with sound stimulation) in comparison with the corresponding control groups without sound stimulation.

Comparing various amplitudes of the stimulating sound, better results were obtained using sound with the intensity of the stimulating sound for 20 dB, then sound with the intensity of the stimulating sound for 10 dB, which is confirmed also by findings of ZAJANČKOVSKIJ (1971). It can be anticipated that chicken perceive the lower power amplitude stimulating sound worse.

While stimulating chicken embryo by artificial sound with variable intensity of sound and frequency, no negative influence of this stimulation on beakclapping of the insufficiently developed chicken was observed.

Table 1: Summarized results of the artificial sound stimulation (intensity of the stimulating sound 10 dB and frequency interval 5.7 Hz) on the Hampshire breed chicken hatching from incubating eggs with the variant of weight

Tabelle 1: Zusammengefaßte Ergebnisse über die Wirkung künstlicher Beschallung (Lautstärke 10 dB, Frequenz 5,7 Hz) auf das Schlüpfen von Hampshire-Küken aus Bruteiern verschiedender Gewichtsklassen

Indicators	Units	1st control group	1st experim. group	2nd control group	2nd experim. group	3rd control group	3rd experim. group	4th control group	4th experim. group
Weight	grams	55–56 x ± s	55-56 x ± s	57–58 x ± s	57-58 x ± s	59-60 x ± s	59-60 x ± s	61-62 x ± s	61-62 x ± s
Average number of incubated eggs	pieces	18.400 ± 2.871	18.400 ± 2.871	18.400 ± 2.871	18.400 ± 2.871	18.400 ± 2.871	18.400 ± 2.871	18.400 ± 2.871	18.400 ± 2.871
Beginning of beakclapping	hours	498.400 ± 7.038	497.375 ± 4.865	504.000 ± 5.263	501.000 ± 3.619	499.000 ± 5.385	493.900 ± 6.771	500.200 ± 7.353	500.500 ± 6.427
All group beakclapping time	hours	13.300 ± 1.536	12.500 ± 2.025	13.000 ± 0.837	11.900 ± 1.281	13.600 ± 1.114	10.600 ± 0.663 *	12.600 ± 0.735	12.600 ± 0.583
hatching time	hours	511.700 ± 8.553	510.300 ± 6.266	517.000 ± 5.577	512.900 ± 3.231	512.400 ± 6.866	504.200 ± 7.380	512.800 ± 6.947	513.100 ± 6.256
embryonic mortality	%	0.000	0.000	0.909 ± 1.818	3.668 ± 3.056	0.000	0.909 ± 1.818	0.000	1.000 ± 2.000

* $P < 0.05$

Table 2: Summarized results of the artificial sound stimulation (intensity of the stimulating sound 20 dB and frequency interval 5.7 Hz) on the Hampshire breed chicken hatching from incubating eggs with the variant of weight

Tabelle 2: Zusammengefaßte Ergebnisse über die Wirkung künstlicher Beschallung (Lautstärke 20 dB, Frequenz 5,7 Hz) auf das Schlüpfen von Hampshire-Küken aus Bruteiern verschiedender Gewichtsklassen

Indicators	Units	1st control group	1st experim. group	2nd control group	2nd experim. group	3rd control group	3rd experim. group	4th control group	4th experim. group
Weight	grams	55–56 x ± s	55–56 x ± s	57–58 x ± s	57-58 x ± s	59-60 x ± s	59-60 x ± s	61-62 x ± s	61-62 x ± s
Average number of incubated eggs	pieces	18.000 ± 2.757	18.000 ± 2.757	18.000 ± 2.757	18.000 ± 2.757	18.000 ± 2.757	18.000 ± 2.757	18.000 ± 2.757	18.000 ± 2.757
Beginning of beakclapping	hours	498.300 ± 3.473	496.500 ± 5.550	500.600 ± 1.241	498.600 ± 3.105	497.200 ± 3.265	489.500 ± 4.648	495.500 ± 4.909	496.500 ± 5.648
All group beakclapping time	hours	13.600 ± 0.735	13.600 ± 0.860	13.700 ± 1.288	13.000 ± 0.707	12.500 ± 0.447	11.300 ± 0.748	12.900 ± 1.114	11.100 ± 0.860
hatching time	hours	511.900 ± 3.980	510.100 ± 6.296	514.300 ± 2.249	511.600 ± 3.137	509.700 ± 3.586	500.800 ± 5.154 *	508.400 ± 5.894	507.600 ± 6.272
embryonic mortality	%	1.334 ± 2.668	0.000	2.334 ± 2.907	5.320 ± 6.516	0.000	4.446 ± 3.913 *	0.000	0.000

* $P < 0.05$

On the basis of the results, it can be claimed that for the Hampshire breed incubation using an artificial sound stimulation, the most suitable set eggs are those with the weight of 59–60 g, which is partially confirmed by experiments of POLYANICHKIN and VOROKOV (1993).

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