Black Sea Journal of Engineering and Science 2(4): 131-135 (2019)
doi: 10.34248/bsengineering.557938

Black Sea Journal of Engineering and Science
Open Access Journal
e-ISSN: 2619-8991

BSPublishers

Research Article
Volume 2 - Issue 4: 131-135 / October 2019

EFFECT OF MUSIC ON GROWTH PERFORMANCE, CARCASS AND MEAT QUALITY IN BROILERS

Tolga TOLUN[1], Tülin ÇİÇEK RATHERT[1]*

[1]Kahramanmaraş Sütçü Imam University, Faculty of Agriculture, Department of Animal Science, 46040, Onikişubat, Kahramanmaraş, Turkey

Received: *April 24, 2019;* ***Accepted:*** *May 27, 2019;* ***Published:*** *October 01, 2019*

Abstract

This study was conducted to investigate the effects of music on growth performance, carcass and meat quality characteristics and feed conversion rate in broilers. The study was conducted with 630 broiler chicks. One hundred five broiler chicks were randomly distributed into six groups with 105 birds in each. Of these, three groups were treatment groups and three groups were control groups. The animals in the experimental group were exposed to 78 dB music in intervals of 5 minutes and 5-minute pauses over a period of 6 weeks. A standard supply program was applied in the study. The animals in the study were weighed every week and the increase of the body weight was determined. While there was a statistically significant difference in feed conversion rate between treatment and control group ($p<0.05$), no statistically significant differences were found for live weight except for Week 4, carcass weight, leg weight, chest weight and gizzard weight ($p>0.05$). However, the differences between the heart and liver weights of control and experiment groups were statistically highly significant ($p<0.01$). Also the chemical composition of the meat sample was analyzed for the treatment and control groups. According to the analysis, there were statistically highly significant differences between treatment and control group in crude protein ($p<0.01$), and statistically significant effects on crude fat ($p<0.05$), while there were no statistically significant effects on dry matter and crude ash.

Keywords: Broilers, Music, Growth, Performance, Quality

***Corresponding author:** Kahramanmaraş Sütçü Imam University, Faculty of Agriculture, Department of Animal Science, 46040, Onikişubat, Kahramanmaraş, Turkey
E mail: tuci@ksu.edu.tr (T. ÇİÇEK RATHERT)
Tolga TOLUN https://orcid.org/0000-0003-4081-1222
Tülin ÇİÇEK RATHERT https://orcid.org/0000-0001-9294-6132
Cite as: Tolun T, Çiçek Rathert T. 2019. Effect of music on growth performance, carcass and meat quality in broilers. BSJ Eng Sci, 2(4): 131-135.

1. Introduction

There is no doubt that due to the growing world population along with the necessity to meet nutrition demands, providing cheaper and high quality animal protein products through chicken meat and eggs has become an important issue in animal production. After technological developments particularly seen after the 1960s (Algers et al., 1978; AOAC, 1990), egg and chicken meat production has developed as a separate industry branch. The fact that chicken meat is not banned by any belief or culture in the world has additionally contributed to the development of this industry. Researchers have headed for alternative care and nutrition methods and alternative production models other than selection and hybridization in order to carry chicken meat and egg production from today to tomorrow and to further increase their yields.

Given the effects of music on the well-being on humans (e.g. Vural, 2006; Yıldırım and Gürkan, 2007; İşkey, 2008), it is remarkable that potential effects of music or other sound stimuli on animals have not been highlighted in research. However, there is some evidence that the auditory areas of animal brains are affected by noises and music, respectively. As a general finding, it has been shown that noise is a source of stress for animals (Algers et al., 1978; Campo et al, 2004), and that the relaxing or cacophonous quality of music causes relaxation or stress in animals (Phillips, 1993). Lobel (2008), for example, showed that there is a negative effect of noise coming from filters in aquariums on fish species because animal communication is disturbed. It has also been shown that music can be used to condition the behavior of cows (Uetake, 1997; Oostra, 2000), and that cows react positively in terms of stress behavior when they are exposed to calf voices (Pollock and Hurnik, 1978).

Research has been carried out in particular with fish and cattle with inconclusive results. Investigating the effect of sound on growth performance in fish, some studies report positive effects (Vasantha et al., 2003; Papoutsoglou et al., 2007; Çatlı, 2010), while Imanpoor et al. (2010) did not reveal any effects. Wells et al. (2006) report that milk cows are more sensitive to music than other cattle. Indeed, positive effects on milk production were reported by McCowan et al. (2002) and Joseph (2006), while Kıyıcı et al. (2013) found in their study that exposition to music had no effect on cow milk production.

In the light of the limited body of research and rather inconclusive results, this study aimed to contribute to a deeper understanding of the potential role of music on performance traits of broilers. For this reason, in the current study a treatment group was exposed to music to detect, if any, effects of music on feed conversion rate, growth performance traits, chemical composition and color quality characteristics of meat.

2. Material and Method

2.1. Material

This research was carried out in the poultry units at the Animal Production Research and Application Center of Kahramanmaraş Sütçü Imam University in May and June over a period of six weeks. A total of 630 broilers was used. The animal material used was Ross 308. The animals were kept in cages consisting of departments separated with wire fences. Ventilation was provided from windows. Placement frequency of animals used in the experiment was designed to have a maximum of 12 broiler chicks per 1 m^2.

2.2. Method

The randomly selected broilers were taken into the orientation session during the first week, and then placed in two compartments in the enclosed area, including the treatment and control groups. The groups were separated into 3 recurrences with 105 broilers in each compartment. The group, which was divided as a treatment group, was exposed to music intending to engage the animals in movement at 78 dB frequency. The exposure was organized in 5 minutes delivery of music interrupted by 5-minute pauses. In the first three weeks, the broilers were given a starter diet containing 21.13 % crude protein and 3011 kcal/kg metabolizable energy, and in the weeks 4-6 a grower diet was given containing 19.43 % crude protein and 3095 kcal/kg metabolizable energy. Total feed consumption during the 6-week treatment was measured, and feed conversion rate was calculated at study end. At a weekly basis live weight was measured. At study end, carcass weight, leg weight, chest weight and gizzard weight were determined. Additionally, chemical composition (AOAC, 1990) and color quality characteristics (Luo et al., 2001) of the meat were analyzed, and feed conversion rate was calculated. The statistical analyzes were carried out using binary *T* test.

3. Results

In this section the results of the study are presented. To determine potential effects, feed consumption, feed conversion rates, changes in live weight, carcass characteristics and meat characteristics as evidenced in chemical composition and color quality were examined.

Table 1 shows that no statistically significant differences were found between the treatment group and the control group in feed consumption.

Table 1. Feed consumption for control and treatment groups

Groups	N	$\bar{X} \pm S$	T	P
Control	3	5137.4 ± 95.38	-0.901	0.419
Treatment	3	5192.8 ± 47.23		

At study end, feed conversion rates were calculated. Table 2 shows that there was a statistically significant difference in that the treatment had a positive effect on feed conversion.

Table 2. Feed conversion rates for control and treatment groups

Groups	N	$\bar{X} \pm S$	T	P
Control	3	1.77 ± 0.2[a]	3.216	0.032*
Treatment	3	1.67 ± 0.5[b]		

[a, b] tatistically significant differences between groups are indicated through different letters. *p<0.05.

Table 3 shows the results of the live weight averages measured separately for every week. The treatment showed a positive effect on live weight; however, this effect was not statistically significant except for week 4.

The analysis of the examination of the carcass characteristics shown in Table 4 revealed statistically highly significant differences for heart and liver (p<0.001), while there were no statistically significant

differences between the control and the treatment group for the other characteristics studied.

Table 3. Weekly live weight averages for control and treatment groups

Week	Groups	$\bar{X} \pm S$	T	P
1	Control	180.5 ± 2.6	-1.753	0.154
	Treatment	183.3 ± 0.6		
2	Control	529.4 ± 6.4	-0.448	0.677
	Treatment	533.0 ± 12.2		
3	Control	1029.2 ± 24.2	-1.380	0.240
	Treatment	1052.2 ± 15.7		
4	Control	1656.8 ± 3.1[a]	-3.915	0.017*
	Treatment	1695.7 ± 16.9[b]		
5	Control	2385.0 ± 7.9	-1.686	0.10
	Treatment	2402.5 ± 16.1		
6	Control	2953.4 ± 48.7	-2.382	0.076
	Treatment	3028.9 ± 25.2		

[a, b]Statistically significant differences between groups are indicated through different letters. *p<0.05.

Table 4. Carcass characteristics for control and treatment groups

	Groups	N	$\bar{X} \pm S$	T	P
Carcass	C	30	2136.0 ± 208	-1.015	0.314
	T	30	2198.3 ± 263		
Chicken leg	C	30	594.3 ± 74.5	-1.260	0.213
	T	30	622.4 ± 96.7		
Wing	C	30	181.3 ± 22.8	0.501	0.618
	T	30	178.4 ± 22.9		
Chest	C	30	688.5 ± 75.9	-0.169	0.867
	T	30	692.1 ± 90.1		
Heart	C	30	22.4 ± 5.1[a]	2.763	0.008**
	T	30	18.9 ± 4.4[b]		
Liver	C	30	84.9 ± 12.9[a]	2.837	0.006**
	T	30	76.1 ± 11.1[b]		
Gizzard	C	30	82.2 ± 22.8	0.085	0.932
	T	30	81.7 ± 19.2		

[a, b]Statistically significant differences between groups are indicated through different letters. **p<0.01.

As shown in Table 5, different parameters were examined in order to investigate effects of the treatment on the chemical composition of the meat. The analysis revealed for protein a statistically highly significant difference (p<0.01) and for crude fat and pH statistically significant differences (p<0.05), while the values for dry matter and crude ash did not display statistically significant differences (p>0,05).

Table 6 shows the results of the examination of color intensities of meat. No statistically significant differences (p>0,05) were detected.

Table 5. Chemical composition of the meat for control and treatment groups

	Group	N	$\bar{X} \pm S$	T	P
Protein (%)	Control	9	24.9 ± 0.5[a]	2.995	0.009**
	Treatment	9	24.2 ± 0.3[b]		
Crude fat (%)	Control	9	2.0 ± 0.8[a]	-2.656	0.017*
	Treatment	9	2.9 ± 0.6[b]		
Dry matter (%)	Control	9	27.1 ± 0.4	-3.383	0.707
	Treatment	9	27.2 ± 0.9		
Crude ash (%)	Control	9	1.6 ± 0.3	0.206	0.839
	Treatment	9	1.5 ± 0.3		
pH	Control	9	5.8 ± 0.07[a]	-2.933	0.010*
	Treatment	9	5.9 ± 0.02[b]		

a,b: Statistically significant differences between groups are indicated through different letters. *p<0.05, **p<0.01.

Table 6. Color intensities for control and treatment groups

	Group	N	$\bar{X} \pm S$	T	P
L	Control	30	44.5 ± 3.5	0.510	0.612
	Treatment	30	44.1 ± 3.3		
a	Control	30	6.9 ± 2.0	-1.609	0.113
	Treatment	30	7.7 ± 1.8		
b	Control	30	4.0 ± 1.9	-0.419	0.677
	Treatment	30	4.2 ± 1.6		

4. Discussion and Conclusion

This study investigated the effect of music on growth performance and carcass and meat characteristics on broilers. Additionally, feed conversion rate was analyzed. The results showed statistically significant differences between the treatment and control group for some of the parameters examined.

By and large, this study indicates that music can have a positive effect on growth performances as also indicated in other studies (Vansantha et al., 2003; Papoutsouglo et al., 2007; Çatlı, 2010). Stated differently, the implementation of treatments benefitting from music to address auditory systems of the animal brain may be meaningful to gain higher yields in animal production as reported in studies examining effects of acoustic stimuli to increase milk production in cows (McCowan et al., 2002; Joseph, 2006). However, it should be noted that the results of the current study are discussed in the light of studies conducted with other animals. For this reason, generalizations should be done with care. The lack of studies investigating potential effects of music on broilers is an additional aspect that does not allow evaluating the findings gained in this study easily. In spite of assumed effects of auditory stimuli on farm animals (Grandin, 2008) and potential benefits of exploiting sensory capacity of animals to foster requested animal behavior in farm animal production (Arave, 1996), the current state of research in this issue is unsatisfying, and particularly in the Turkish context we see some local studies not meeting research criteria (Kıyıcı et al, 2013).

These limitations lend themselves to suggestions for further research. For one thing, we suggest conducting research on poultry to gain more robust results proving or contradicting the results gained in this study. Also, different kinds of music displaying different rhythm variations may be employed to reach at a finer understanding of potential effects of music on performance parameters (Phillips, 1993). Finally, the examination of a variety of parameters will contribute to a wider knowledge base on this issue. We hope that the current study provides reference work for the future studies.

Conflict of interest

The authors declare that there is no conflict of interest.

Acknowledgements

This research was presented as an oral presentation at the International Congress on Domestic Animal Breeding Genetics and Husbandry (ICABGEH-2018) held on 26-28

September 2018 in Antalya.

References

Algers B, Ekesbo I, Sromberg S. 1978. The impact of continuous noise on animal health. Acta Vet Scand, 68: 1–26.

Arave CW. 1996. Assessing sensory capacity of animals using operant technology. Journal of Animal Science 74(8): 1996-2009.

AOAC 1990. Official method of analysis. Association of Official Analytical Chemists.15th.edition. Washington, DC. USA. P: 66-88.

Campo JL, Gil MG, Da´vila SG. 2005. Effects of specific noise and music stimuli on stress and fear levels of laying hens of several breeds. Applied Animal Behavior Science. 91(1): 75–84.

Çatlı T. 2010. Kalkan balığı (Psettamaeotica, Pallas.1814) yetiştiriciliğinde müziğin büyüme ve et kalitesi üzerine etkisi. Muğla Üniversitesi Fen Bilimleri Enstitüsü, Yüksek Lisans Tezi.

Grandin T. 2008. Mental well-being in farm animals: how they think and feel. Mental Health and Well-Being in Animals: 243–257. doi:10.1002/9780470384947.ch18.

Imanpoor MR, Bagheri T, Hedayeti SAA, 2010. The anesthetic effects of clove essence in Persian sturgeon (Acipenserpersicus). World J Fishand Marine Sci, 2(1): 29-36.

İşkey M. 2008. Anjiografi işlemi öncesi ve işlem sırasında müzik dinlemenin bireylerin anksiyete düzeyi ve yaşam bulgularına etkisi. Cumhuriyet Üniversitesi Sağlık Bilimleri Enstitüsü Psikiyatri Hemşireliği Anabilim Dalı, Yüksek Lisans Tezi.

Joseph J. 2006. Beautiful music can relax animal. The animal world.http://www.network.bestfriends.org/animalworld/news/3580.html (access date: 21.05.2006).

Kıyıcı JM, Koçyiğit R, Tüzemen N, 2013. Klasik müziğin siyah alaca sığırlarda süt verimi, süt bileşeni ve sağım özelliklerine etkisi. Tekirdağ Zir Fak Derg, 10:74-81.

Lobel PS. 1998. Possible species specific court ship sounds by two sympatric cichlid fishes in Lake Malawi, Africa. Environmental Biology of Fishes, (52): 443-452.

Luo MR, Cui G, Rigg B. 2001. The development of the CIE 2000 colour-difference formula: CIEDE 2000. Color. Research and Application, 26(5): 340-350.

McCowan B, DiLorenzo AM, Abichandani S, Borelli C, Cullor J. 2002. Bioacoustic tools for enhancing animal management and productivity: effects of recorded calfvocalizations on milk production in dairy cows. Appl Anim Behav Sci, 77: 13-20.

Pollock WE, Hurnik JF. 1978. Effect of calf calls on rate of milk release of dairy cows. J Dairy Sci, 61: 1624-1626.

Oostra H. 2000. Combining video observations with data files from an automatic milking system. Measuring Behavior 2000: 3rd International Conference on Methods and Techniques in Behavioral Research. 15-18 August 2000. Nijmegan. The Netherlands.

Papoutsoglou SE, Karakatsouli N, Louizos E, Chadio S, Kalogiannis D, Dalla C, Polissidis A, Daifoti ZP. 2007. Effect of Mozart's music (Romanze-Andante of "EineKleineNachtMusik", sol major, K525) stimulus on common carp (Cyprinus carpio L.) physiology under different light conditions. Aquac Eng, 36(1): 61–72.

Phillips CJC. 1993. Cattle behaviour. Farming Press Books. WharfdaleRd. Ipswich

Uetake K, Hurnik JF, Jahnson L. 1997. effect of music on voluntary approach of dairy cows to an automatic milking system. Appl Anim Behav Sci, 53: 175- 182.

Vasantha L, Jeyakumar A, Pitchai MA. 2003. Influence of music on the growth of koi carp, Cyprinus carpio (Pisces: Cyprinidae). NAGA: World Fish Center Quarterly, 26(4): 25-26.

Vural F. 2006. Koroner arter bypass greft uygulamasında düşleme ve müziğin iyileşme sürecine etkisi. Marmara Üniversitesi Sağlık Bilimleri Enstitüsü, DoktoraTezi.

Yıldırım S, Gürkan A. 2007. Müziğin, kemoterapi yan etkilerine ve kaygı düzeyine etkisi. Anadolu Psikiyatri Dergisi, 8: 37-45.

Wells DL, Coleman D, Challis G. 2006. A Note on the effect of auditory stimulation on the behavior and welfare of zoo-housed gorillas. App Anim Behav Sci, 100: 327-332.