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REGULAR ARTICLE

EFFECT OF ADMINISTRATION OF PROBIOTIC PREPARATION WITH STRAIN OF *LACTOBACILLUS FERMENTUM* ON THE WEIGHT GAIN OF THE YOUNG PIGEONS

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ABSTRACT

Probiotic preparations are in the breeding of pigeons used mainly during the racing season for their recovery, but the application of probiotics to enhance the final liveweight of young pigeon is not much known in breeding of racing pigeons. The aim of this work was to examine the possible effects of a probiotic preparation with strain of *Lactobacillus fermentum* to increase a weight gain of young pigeons. In our attempt, we administered probiotic preparation with strain of *Lactobacillus fermentum* from the 1st to the 35th day of an age of pigeons, directly into the beak. On daily basis we were recording their weight, condition and overall health. Breeding pairs were divided into a control group and the two experimental groups. We used the method of laying and hatching with intervention of breeder. The most positive effect of probiotics was recorded in the group with intervention of breeder, where the probiotics were administered to the second pigeon in the nest. The differences in the weight gains were recorded from 4th to the 35th day of age. At the end of the attempt we were able to see differences between 35 – 50 g, what was very significant difference, when it is taking into account that overall weight of the 35-days old pigeons is 418 – 503 g.

Keywords: young pigeon, probiotic preparation, weight gain, statistical significance, *Lactobacillus fermentum*.

INTRODUCTION

The use of the antibiotics in a human and veterinary medicine and in animal nutrition encounters with an increasingly difficulties. Their application undermines the protective microflora of the gastrointestinal tract and significantly reduces the effectiveness of the intestinal barrier to infection. Gradually is increasing a resistance of microorganisms to antibiotics on account of their excessive use, which significantly limits the possibility of therapeutic application. Research and development of alternative methods to antibiotics was significantly intensified. Among them have an important position probiotics **(Bomba *et al.*, 1997).**

Probiotics are defined as live microbial food supplements, which beneficially influence humans and animals, and that can promote bird health by reducing pathogen colonization **(Lee *et al.*, 2008, Stringfellow *et al.*, 2011)**. Probiotics are pure or mixed cultures of viable microorganisms, which after application positively affect the host organism by improving the properties of microflora in the gastrointestinal tract, the change of representation microflora in gastrointestinal tract, helping farm animals to achieve higher performance, are used to colonization in young animals or after antibiotic treatment **(Tvrzník - Zeman, 2010).** The host organism provides for probiotic microorganisms a secure niche (gut cavity) and nutrition, probiotic microbes are kept safely, choose not to get into the indoor environment, induce the microbial mechanisms that are safe for them and conversely to reduce the formation of dangerous inflammatory products for these and a host organism **(Trebichavský - Splichal, 2006).**

Probiotics are isolated lactic acid bacteria, mostly in dry frozen form. By feeding these products occurs colonization intestinal by bacteria. Existing scientific evidence demonstrates that germs attached to gut wall do not affect very stable ecosystem intestinal microflora long. After discontinuation of probiotics it occurs to a gradual decrease in lactic acid bacteria in the gut **(Müller, 2006).**

Application of probiotics optimizes the digestive process, reduces the risk of digestive disorders that create a predisposition for success of pathogenic and conditionally pathogenic microorganisms. Optimization of the digestive processes by probiotics is in animals also reflected in a growth-stimulating effect and in increasing of weight gain **(Bomba, 2010).** Effective probiotic should be at industrial scale the viable product, it can stayes stable and viable for a long periods in praletic storage conditions, will be able to survive (not necessarily

grow) in the intestine and will have beneficial effects on the host organism **(Lima-Filho, 2000).**

The objective of attempt was to verify an impact of the selected probiotic preparation on the growth of racing pigeons.

MATERIAL AND METHODS

Used probiotic preparation and its administration

Examined was the effect of probiotic preparation with strain of *Lactobacillus fermentum,* routinely used on convalescence of pigeons after the race. The probiotic component was the *Lactobacillus fermentum* CCM 7158 $1x10^8$ $CFU.g^{-1}$. Potent ingredient: maltodextrine and fructooligosaccharide is incorporated in the formulation at 1 % concentration. The probiotic preparation with strain of *Lactobacillus fermentum* increases weight gain, feed conversion and stimulates the immunity. It does not contain any foreign substances and its use in practice does not require the withdrawal of feed before slaughter. The probiotic preparation was administered in a dose of 0.01 g per day. The preparation was dispersed in water, which originated from home source of the breeder and was not chlorinated. Probiotic preparation was administered directly into the beak of 1st to 35th day of pigeon age.

The method of laying and hatching

In the control group and two experimental groups, we used the method of laying and hatching with intervention of breeder. In this method occurs to withdrawal of the first egg immediately after lay, egg is labelled and then saved into a cold room with a maximal temperature of 20 °C to prevent the initiation the development of the embryo. After laying the second egg, the first egg is returned back into the nest and it begins their development. Time differences in the laying between the first and the second egg are from 24 to 48 hours. By this method was ensured a hatching in a minimum time space and the balanced weight of young pigeon in the beginning of our attempt.

Used line of racing pigeons

In an attempt were included pigeons lines Jansen and Klinghamer. Parent couples were aged 3 years and were placed in breeding pigeons and were excluded from the participation in the races. Overall, in an attempt were involved 42 breeding pigeons, which created 21 pairs, divided into 3 groups. In the control group was not administered probiotic preparation, in the experimental group 1 was administered a preparation to both of young pigeons and in the experimental group 2 was administered a preparation only to the one of young pigeon in the nest.

Evaluation of the results

To evaluate the statistical significance of differences in weight gain of young pigeons we used data analysis by Student's t-test in MS Office.

RESULTS AND DISCUSSION

In relation to the absence of the literature data on the use of probiotics in breeding of pigeons, we focused our attention on the comparison of the results obtained by us with the results of the application of the same probiotic strain in other poultry species. In attempts, we investigated the effect of a probiotic preparation with strain of *Lactobacillus fermentum* on the weight gain of young pigeons.

From the obtained results (table 1) we found a positive effect of probiotic preparation, which resulted in the experimental group 2. In this group was the probiotic preparation administered only to the second pigeon in the nest, where occurred to an increase the weight difference compared with the first pigeon. This difference ranged from 20 g in the early days of experiment to 53 g in the last days of experiment. In the control group, where was not administered the probiotic preparation and in experimental group 1, where the probiotic preparation was administered to both pigeons, the mass differences throughout the period ranged from -15 to 16 g. In experimental group 1, the positive effect of probiotic preparation was manifested with weight gain of young pigeons compared to control group during the whole time of experiment. **Torres-Rodriguez *et al.* (2007)** administered to turkey probiotics based on various strains of *Lactobacillus spp*. and observed differences in live weight, average daily gain, feed conversion and production costs.

Table 1 Weekly weight gain of young pigeons in monitored groups (g)

		Control gorup			Experimental group 1			Experimental group 2		
		1. egg	2. egg	Weight difference (1. egg-2. egg)	1. egg	2. egg	Weight difference (1. egg-2. egg)	1. egg	2. egg	Weight difference (1. egg-2. egg)
Pair 1	**1.day**	12	14	2	12	14	-2	14	12	2
	7. day	108	104	-4	118	114	4	84	108	24
	14. day	311	313	2	331	333	-2	273	311	38
	21. day	453	449	-4	453	459	-6	379	453	74
	28. day	503	508	5	503	503	0	441	503	62
	35. day	491	495	4	492	497	-5	455	491	36
Pair 2	**1.day**	15	14	-1	15	14	1	15	14	-1
	7. day	116	120	4	116	120	-4	116	130	14
	14. day	295	303	8	299	302	-3	295	323	28
	21. day	429	432	3	439	432	7	376	432	56
	28. day	471	461	-10	491	483	8	431	461	30
	35. day	428	431	3	478	481	-3	428	451	23
Pair 3	**1.day**	13	15	2	13	15	-2	15	13	-2
	7. day	142	137	-5	93	97	-4	137	152	15
	14. day	309	308	-1	311	318	-7	308	356	48
	21. day	391	389	-2	391	388	3	389	466	77
	28. day	499	492	-7	499	493	6	462	499	37
	35. day	461	469	8	486	489	-3	461	489	28
Pair 4	**1.day**	15	13	-2	15	13	2	15	13	-2
	7. day	75	80	5	91	95	-4	75	95	20
	14. day	211	208	-3	221	218	3	201	228	27
	21. day	309	342	33	399	394	5	309	342	33
	28. day	395	380	-15	487	479	8	395	421	26
	35. day	457	453	-4	477	483	-6	437	473	36
Pair 5	**1.day**	14	16	2	14	16	-2	16	14	-2
	7. day	85	77	-8	85	89	-4	77	85	8
	14. day	271	269	-2	272	276	-4	-	271	271
	21. day	379	365	-14	390	385	5	-	401	401
	28. day	446	458	12	476	470	6	-	513	513
	35. day	442	447	5	472	463	9	-	502	502
Pair 6	**1.day**	14	14	0	14	14	0	14	14	0
	7. day	128	133	5	129	133	-4	128	133	5
	14. day	329	326	-3	329	336	-7	279	326	47
	21. day	424	424	0	429	425	4	414	434	20
	28. day	492	508	16	485	493	-8	482	508	26
	35. day	499	497	-2	479	487	-8	469	497	28
Pair 7	**1.day**	15	14	-1	15	14	1	15	14	-1
	7. day	104	111	7	106	112	-6	104	111	7
	14. day	275	261	-14	271	276	-5	275	361	86
	21. day	377	381	4	395	389	6	377	479	102
	28. day	453	443	-10	503	513	-10	423	493	70
	35. day	450	453	3	490	483	7	440	493	53

The use of selected commercial probiotic led to increased live weight and reduced production costs. **Chmelničná (2002)** followed the effect of probiotic preparation Lactiferm L-50 in fattening of turkeys to 12 weeks of age. By continuous administration of probiotics was observed a positive effect of the preparation on the body weight of turkeys compared with control. **Kyselovič and Ďuranová (1998)** implemented an attempt on fattening ducks to the 56th days of age with the application of probiotics Lactiferm to increase live weight, feed conversion and mortality. Results achieved showed the positive impact of probiotics

Lactiferm applications on increasing live weight. On the basis of an evaluation of fattening of ducks in the years 1990 to 1994 indicates **Weis (1997)**, that any form of application of probiotics increased body weight of ducks and decreased mortality. With the probiotic strain of *Lactobacillus fermentum* implemented **Weis *et al.* (2007)** an attempt in fattening of broiler chickens, where the addition of probiotics positively influenced the final live weight. The positive effect of probiotic strain *Lactobacillus fermentum CCM 7158* on the final body weight of broiler chickens found also **Pál (2011).**

In the observed groups was manifested a positive interference of method of laying and hatching with the intervention of breeder, after using this method young pigeons were hatched in a minimal time-gap and their growth was in balance until the end of the attempt.

The statistical significance of the observed live weights of young pigeons

In evaluating the obtained results we used Student's t-test in MS Office. We focused mainly on finding the statistical significance of detected weights in the observed groups. We compared the weight of the first and the second young pigeons in all pairs in each group at 1st, 7th, 14th, 21st, 28th and 35th day of age (Table 2).

Table 2 Results of Student's t-test in individual groups

	1. day		7. day		14. day		21. day		28. day		35. day	
Control group	-0,51	-	-0,05	-	0,09	-	-0,12	-	-0,01	-	-0,18	-
Experimental group 1	0,52	-	0,07	-	0,08	-	-0,16	-	0,03	-	0,16	-
Experimental group 2	1,66	-	-0,81	-	-1,43	-	-2,46	+	-2,43	+	-3,31	++

Legend: - P ≥ 0.05 statistically nonsignificant, + P < statistically significant 0.05, + + P 0.01 < highly statistically significant

In the control group and in the experimental group 1 we found that during the entire 35 days weights differences were statistically nonsignificant (P ≥ 0.05). This is caused by minimal differences in weights of young pigeons from the 1st and the 2nd egg and by their balanced growth.

In the experimental group 2, we found that from the 1st to the 14th day were obtained the differences in weights of both young pigeons statistically non significant (P ≥ 0.05), for the 21st and 28th day was statistically significant (P < 0.05) and the 35th day were highly statistically significant (P < 0.01). The gradual increase differences in weights of the 1st and

the 2nd young pigeons in the experimental group is in the favour of the second pigeon in the nest to whose was administered the probiotic preparation and it is visible a gradual increase of the statistical significance of these differences observed during 35 days. **Pál (2011)** when administering of probiotic preparation with the strain of *Lactobacillus fermentum* in broiler chicken found highly statistically significant difference ($P \leq 0.01$) in comparison different groups, in favour of experimental groups with the addition of probiotic preparation.

CONCLUSION

In the breeding of young pigeons we meet with several problems associated with the unequal growth and weight loss during the weaning period. Use of probiotic preparation can have a positive impact on the course of growth and live weight of young pigeons in the nest. This positive effect is manifested by increased weight gains during rearing and subsequently also by higher live weight at the time of weaning of young pigeons, as indicated in Table 1. The administration of probiotic preparation to the young pigeon from the second egg in all observed pairs was reflected by increased weight gains and weight differences between the young pigeons in the nest. The probiotic preparation significantly ($P < 0.01$) supported the growth of young pigeons, which was reflected their weights increased at the 35th final day of age compared with the control group. This method of administration of probiotic preparation to the young pigeon directly into the beak from the first day of age is more time consuming, but the reward for breeder are strong, executive and healthy pigeons.

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REFERENCES

BOMBA, A. 2010. Probiotiká v prevencii a liečbe chorôb ľudí a zvierat, Ústav gnotobiológie a prevencie chorôb mláďat Univerzity veterinárskeho lekárstva, Košice. [on-line] [cit. 2010-02-19] Dostupné na internete: <www.probiofix.sk/downloads/1l.pdf>.

FILHO – LIMA, J. – VIEIRA, E. – NICOLI, J. 2000. Antagonistic effect of Lactobacillus acidophilus, *Sacharomyces boulardii* and *Escherichia coli* combinations against experimental infecions with *Shigella fleneri* and *Salmonela* enteriditis supsp. Typhimurium ir gnotobiotic mice. In *Journal of Application Microbiologi*, 2000, p. 131-139.

CHMELNIČNÁ, L. 2002. Účinok pripravku probiotika do pitnej vody na základe jatočnej vality moriek. In *Chov hydiny a malyých hospodárskych zvierat v 3. tisícročí*. Nitra : SPU, 2002, s. 55-58. ISBN 80-8069-074-X.

KYSELOVIČ, J. – ĎURANOVÁ, M. 1998. Vplyv aplikácie probiotík na úroveň biochemických ukazovateľov v krvnom sére hydiny. In *I. probiotický kongres*, Galanta: Mediapharm, 1998, s. 36-42.

LEE, N.K. - YUN, C.W. - KIM, S.W. - CHANG, H.I. - KANG, C.W. - PAIK, H.D. 2008. Screening of Lactobacilli derived from chicken feces and partial characterization of Lactobacillus acidophilus A12 as an animal probiotics. In *Journal of Microbiology and Biotechnology*, vol. 18, 2008, p. 338-342.

MÜLLER, L. 2006. Hefe - präbiotischen Naturprodukt, In: *Die Brieftaube* 15/2006.

PÁL, G. 2011. Využitie neantibiotických stimulátorov rastu na úžitkové parametre hydiny. Dizertačná práca. SPU Nitra. s. 133. 2011.

STRINGFELLOW, K. - CALDWELL, D. - LEE, J. - MOHNL, M. - BELTRAN, R. - SCHATZMAYR, G. - FITZ-COY, S. - BROUSSARD, C. - FARNELL, M. 2011. Evaluation of probiotic administration on the immune response of coccidiosis-vaccinated broilers. In *Poultry Science*, vol. 90, 2011, no. 8, p. 1652-1658.

TORRES-RODRIGUEZ, A. – DONOGHUE, A. M. – DONOGHUE, D. J. et al. 2007. Performance and condemnation rate analysis of commercial turkey flocks treated with a *Lactobacillus* spp. - based probiotic. In *Poultry Science*, roč. 86, 2007, č. 5, s. 444-446.

TREBICHAVSKY, I. – SPLICHAL, I. 2006. Probiotics manupulate host cytokine response and induce antimicrobial peptides. In *Folia Microbiologica,* s, 507-510. 2006

TVRZNÍK, P. – ZEMAN, L. Legislativní aspekty doplňkových látek. In OPLETAL, L. – SKŘIVANOVÁ,V. (Eds) Přírodní látky a jejich biologická aktivita Svazek 2. Praha : Karolinum, 2010. ISBN 978-80-246-1801-2, s. 87-174.

WEIS, J. 1997. Využitie probiotík v chove kačíc. In *Slovenský chov*, roč. 2, 1997, č. 12, s. 20-21.

WEIS, J. – CIVÁŇ, S. – HRNČÁR, C. 2007. The effect of two-elemented probiotic preparate on basic fattening parameters of hybrid Hubbard JV. In *Scientifical Papers. Animal Breeding toward a Sustainable Agriculture*, roč. 40, 2007, č. 1, p. 614-618.