PROTECTION OF THIN INTESTINE MUCOUS WITH PHYTOBIOTICS IN SWINE

Olga-Alina RADA[1], Mihaela OSTAN[1], Iuliana CREŢESCU[2]

[1]Banat's University of Agricultural Sciences and Veterinary Medicine Timişoara, Faculty of Agriculture, Romania
[3]Victor Babes University of Medicine and Pharmacy, 2 Square Eftimie Murgu, 300041, Timişoara, Romania
mihaela_ostan@yahoo.com

Abstract: *the aim of the current paper was to test the phytobiotic product Dysantic in fatty pigs not vaccinated against ileitis caused by Lawsonia intracellularis. In the experimental part was used as biological material 77 fattening pigs. 60 pigs allotted into two groups (G_1 and G_2) were stressed, and 17 unstressed pigs formed the control group G_3. The group G_1 receiving the tested phytobiotic Dysantic the mixed fodder for 7 days, and the other two groups were given the usual fodder. The growth parameters were monitored and cases of diarrhoea. They were collected faeces samples for determination of dry matter and determining occult haemorrhages and blood samples for serological diagnosis of ileitis. The experiment was completed with morphological examination of the small intestine. Contamination of experimental pigs with Lawsonia intracellularis was demonstrated by ELISA test, 40% of the samples examined were serologically positive. The group food supplements pigs with Dysantic (G1) produced an average daily gain of 23.17% higher than the control group stressed pigs (G2) and 4.21% lower than the non-stressed group of pigs (G3). Throughout the experimental period, the number of cases of diarrhoea was higher in group stressed pigs (G2). Dysantic product improves growth performance in pigs fat and reduce cases of diarrhea in pigs not vaccinated against ileitis.*

Key words**:** *Dysantic, phytobiotic, pig, ileitis, Lawsonia intracelularis, growth parameters*

INTRODUCTION

Current demographic growth asks for increasing animal production to meet the increasing demand for food. This can be done through artificialisation of growth conditions and particularly through an increase of animal numbers per unit, which resulted in increased contamination stress.

Using biostimulating antibiotics in sub-therapeutic dosage, farmers have reduced bacterial infections and improved health state and weight gain in animals. Despite all this, there have also been antibiotic-resistant bacteria stems [2], which questions the efficiency of antibiotic treatments and the occurrence of serious diseases in both humans and animals.

Starting with January 1, 2006, the European Community completely forbids the use of antibiotics in animal feed. Taking into account the ban on antibiotics, the use of natural growth promoters (NGP), manipulation of mixed feed composition combined with optimal managerial strategies can be a viable alternative to the use of antibiotics in animal feed [3, 6, 7]. They have developed a wide range of prebiotic, probiotic, symbiotic products as well as other growth promoters with variable efficiency in some infectious and metabolic diseases.

Research shows that microorganisms forms used as additives in feed have favourable effects on animals because they protect intestinal flora and favour growth parameters [8] and animal's health state, reducing maintenance costs.

They have developed prebiotics defined as "un-digestible feed additives that affect the host organism beneficially by stimulating selectively the growth and/or activity of one or more species of bacteria in the digestive tract" [4] to ensure nutritive support in the development of organism-friendly bacteria: oligosaccharides and polysaccharides, organic acids and enzymes used as additives in feeds and also essential oils (phyto-biotics) extracted from plants.

Bioactive components in plants are especially secondary metabolites such as terpinoids, phenols (tannins), glycosides and alkaloids (alcohols, ketones, aldehydes, esters, ethers, lactones) [5]. The beneficial effects attributed to the plants are antibacterial, antifungal, antioxidant, antitumor, immunomodulator, etc.

The product Dysantic is a phytobiotic containing thyme (*Thymus vulgaris*) and carob (*Ceratonia siliqua*). The volatile thyme oil contains substances [1] among which thymol and carvacrol that seem to have complex pharmacodynamic action (antiinfectious, antibacterial, antifungal, and antiviral) and carob powder, besides its high content in sugars and minerals, supports the development of beneficial intestinal flora.

MATERIALS AND METHODS

The experiment was carried out on 77 fattening swine that were not inoculated against ileitis.

It is known that the presence of the bacterium *Brachispira hyodisenteriae* in the digestive tract of swine triggers, under stress, swine dysentery after 5 days; this is why we have mixed, weighed and accommodated 60 pigs from two different boxes (G_1 and G_2) according to the experimental protocol (Table 1). There was also control box G_3 in which non-inoculated swine were not stressed by mixing with swine from other boxes.

Table 1

Experimental protocol

Lot	Immunologic state	Number of swine
G_1 (Dysantic 2‰)	Non-inoculated	30
G_2 (Stressed control)	Non-inoculated	30
G_3 (Non-stressed control)	Non-inoculated	17

The swine were fed on the feed recipe presented in Table 2. The premix Dysantic was administered for 7 days.

The swine were weighed at the beginning and at the end of the experiment (after 14 days) and we measured their weekly feed consumption.

The cases of diarrhoea were monitored for 14 days after the administration of the premix to be tested; the swine with diarrhoea were treated individually with injectable Lincospectin for at least 3 days.

From swine with diarrhoea, we sampled faeces to determine content of dry matter (by drying in drying closet at 150^0C); faeces samples were analysed for occult haemorrhage with the Adler test.

We sampled blood from 10 swine for ileitis serologic diagnosis (dosage of antibodies against *Lawsonia intracellularis* through the ELISA blocking with Kit: Bioscreen Ileitis Antibody ELISA – manufacturer Bioscreen erdmc GmbH Germany); at the end of the experiment, we slaughtered a swine for morpho-pathologic diagnosis.

The differences between the groups were interpreted statistically with the nonparametric Mann Whitney U Test.

RESULTS AND DISCUSSION

1. Growth Parameters

Mean body weight in experimental swine lots is shown in Table 3, and mean daily weight gains are shown in Table 4 below.

Table 2

Recipe of mixed feed used in fattening swine

Ingredient	**Incl (%)**
Maize 8% RO	46.11
Wheat RO	20.00
Wheat bran 15%	5.00
Soy grit 46% RO	18.34
Sunflower grit 34% RO	5.30
Sunflower oil	0.80
Lysine HCL	0.38
L Tryptophane	0.02
L Treonine	0.08
DL methionine	0.09
Calcium carbonate	0.60
Monocalcium phosphate	1.10
Salt	0.39
Captex T_2 (mycotoxin inhibitor)	0.50
Mycofix Plus	0.15
Premix for fattening swine 0.5%[x]	0.50
Premix test [xx]	1.00
Sodium bicarbonate	0.14
TOTAL	**100.00**

x – Premix vitaminomineral without iron
xx – Premix 1% with G_1 Dysantic

Table 3

Initial and final body weight (kg) in experimental swine lots

G_1		**G_2**		**G_3**	
Initial	**Final**	**Initial**	**Final**	**Initial**	**Final**
66.11±9.49	81.8±9.92	68.03±9.25	80.77±9.78	63.71±9.53	80.05±10.98

Table 4

Daily weight gain (g/day) in experimental swine lots

	G_1	**G_2**	**G_3**
g/day	1120±3.20	909.28±3.42	1167.14±2.93
%	123.17	100	128.36

The non-stress swine lot (G_3) had the best daily weight gain (1167.14 g/day), 28.36% more than in the stressed swine lot (G_2).

The experimental swine lot G_1 (Dysantic) had a mean weight gain 4.21% less than the non-stressed swine lot G_3. Among stressed swine lots, G_1 had the best weight gain (1,120 g/day), 23.17% more than the control lot (G_2); the same percentage difference was in another experiment and in weaned piglets, which confirms and supports the good effects of the product Dysantic (Figure 1).

A week before the experiment, swine turned from moist feed to dry feed. In the first experimental week, the highest mean daily consumption was in G_3 (Table 5); in G_1 and G_2, mean daily consumption was 4.98% and 17.41% lower, respectively. In the second experimental week, we removed from the feed the mixes to be tested and turned to moist feed. Mean daily consumption in G_1 was 2.10 kg/day, and in G_2 and G_3, 2.04 kg/day.

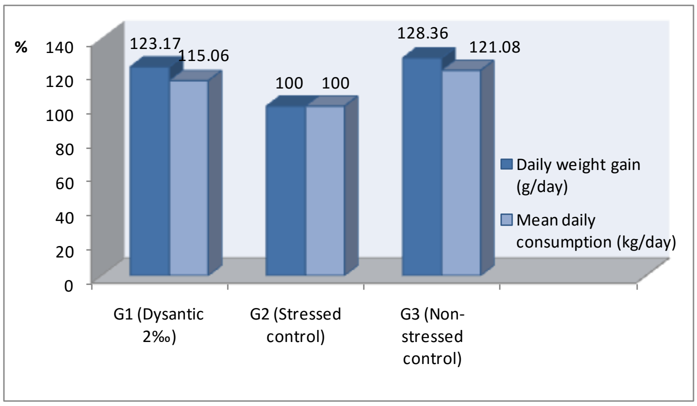

Figure 1. Influence of Dysantic (2‰) on growth parameters in swine

Table 5

Mean daily consumption (kg/day) of feed in the first experimental week

	G_1	G_2	G_3
kg/day	1.91±0.23	1.66±0.92	2.01±0.48
%	115.06	100	124.08

2. Health State

In the pre-experimental week, when the swine got dry feed, there were four cases of diarrhoea in the lot G_1.

The diagramme of the diarrhoeic cases during the experimental period (14 days) is shown in Table 6 and Figure 2. Data analysis shows that in the first experimental week, the number of diarrhoeic cases was larger in stressed swine in the control lot than in non-stressed swine.

Table 6

Cases of diarrhoea during the experimental period

Experimental day	**Lot**		
	G_1	**G_2**	**G_3**
1	0	0	0
2	0	0	0
3	2	3	2
4	0	0	0
5	2	2	0
6	0	0	0
7	1	2	1
Total cases in the 1st experimental week	**5**	**7**	**3**
8	1	0	0
9	0	0	0
10	2	0	2
11	0	0	0
12	2	2	1
13	0	0	0
14	0	2	0
Total cases in the 2nd experimental week	**5**	**6**	**3**

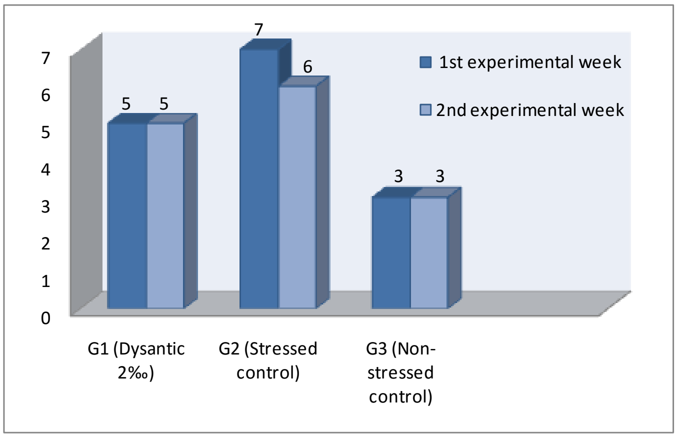

Figure 2. Diagramme of diarrhoeic cases during the experimental period (14 days)

Content of dry matter in faeces is shown in Table 7. The test for occult haemorrhage was negative in all faeces samples analysed.

Table 7

Content in dry matter of faeces in diarrhoeic swine in the experimental lots

G_1	G_2	G_3
26.47	27.50	30.00
25.81	8.33	
12.50		
21.05		

At the end of the experiment, we slaughtered a swine from lot G_1 for anatomo-pathologic examination. Macroscopically, the wall of the terminal ileum was thickened, and the mucous was slightly pleated. The caeccocolic mucous had no dysentery lesions (Figures 3 and 4). Serologic examination shows that 40% of the samples examined were positive to antibodies against *Lawsonia intracellularis*.

Figure 3. Macroscopic aspect of ileum with thickened wall in ileitis (original)

Figure 4. Terminal ileum mucous in swine with ileitis (original)

CONCLUSIONS

Contamination of swine in experimental lots with *Lawsonia intracellularis* was proven through ELISA examination, and 40% of the samples examined serologically were positive.

Lot G_1 supplemented with Dysantic had a mean daily gain weight 4.21% lower than that of non-stressed swine (G3) that, in its turn, had 28.36% more weight gain than the lot of stressed swine (G_2).

The swine supplemented with Dysantic had a mean daily weight gain 23.17% higher than that of the control stressed swine (G_2).

During the entire experimental period (14 days), there were 10 cases of diarrhoea in the swine supplemented with Dysantic, 13 cases in the stressed swine and 6 cases in the non-stress swine.

The product Dysantic improves growth performance in fattening swine and reduces the number of diarrhoeic cases in swine not inoculated against ileitis.

BIBLIOGRAPHY

1. CIULEI, I., GRIGORESCU, E., STĂNESCU URSULA, Plante medicinale, fitochimie şi fitoterapie, Tratat de Farmacognozie, vol. II, Ed. Medicală, București, 1993.

2. CROMWELL, G.L., Why and how antibiotics are used în swine production: În: Procedings of the Pork Industry Conference on Addressing Issue of Antibiotic Use în Livestock Production. Ed. L.B. Schook. Univ. Illinois, Urbana. 7-27, 2000.

3. ELLIOT, M.A., Prebiotic/Probiotic additives and their impact on poultry health and performance, Mid-Atlantic Nutrition Conference, 2004.

4. GIBSON, G.R., ROBEFROID, M.B., Dietary modulation of the human colonic microbiota: Introducing the concept of prebiotics. J Nutr. 125: 1401-1412, 1995.

5. KAMEL, C., A novel look at a classic approach of plant extracts. Feed Mix, 8., 16-17, 2000.

6. KJELDSEN, N., CALLESEN, J., Terminated Use of Antimicrobial Growth Promoters in Pig Production in Denmark- Effects on Pig Welfare and Productivity. 4 BOKU-Symposium Tierernährung, 57-63, 2005.

7. PATTERSON, A.J., Prebiotic Feed Additives: Rationale and Use în Pig. Advances în Pork Production, 16: 149, 2005.

8. RADA, O., OSTAN, M., FERICEAN, M. L., CREȚESCU, I., The effect of supplimenting chicken feed with the Biomin Imbo Synbiotic, Research Journal of Agricultural Science, 47 (2), 156-161, 2015.