Taxifolin impact on the consequences of moderate heat stress in fattening pigs

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Introduction

Crossbred pigs are characterized by nervous instability, limited thermoregulation, and exposure to stress. Climate stress causes behavioral, physiological, functional, productive and other changes in the body of pigs. Antioxidants application (selenium, vitamin E, vitamin C and flavonoids) in pig diets provides solving the problem of oxidative stress effects. It is known that the use of antioxidants in animal diets contributes to the stabilization of free radicals. Dihydroquercetin (Taxifolin, $C_{15}H_{12}O_7$) is the main component of the Diquertin bioflavonoid complex. Taxifolin is a bioflavonoid with a wide range of biological effects: it regulates metabolic processes, has a positive effect on the functional state of the internal organs, creates mechanisms for protecting healthy cells from pathologies caused by chemical toxicity, electromagnetic emission and radiation, by eliminating radical activity, viral and bacterial processes. The use of antioxidants in animal diets can reduce the negative impact of heat stress. The research aim is to study the efficiency of feeding Taxifolin (TAX) to pigs under moderate heat stress conditions.

Material & Methods

The experiment was performed on crossbred ((BWxL)xD) pigs (BW1=17.2-17.4 kg, 58 days old, N=27) during the fattening period. The animals were in 3 groups: Group 1-control (standard forage-SF, n=9), Group 2-experimental (SF+32 mg/kg Tax, n=9), Group 3-experimental (SF, feeding Tax (32 mg/kg) periodically for 7 days at the beginning and at the end of the experiment, as well as when changing feeds, n=9). The animals were kept in a standard pig house, 3 in a stall. To simulate moderate heat stress, the temperature was within the range of +75.0...+81.5°F with a humidity of 60-85% (Fig. 1). Experiments on animals were carried in the physiological yard and laboratories of the L.K. Ernst Federal Research Center for Animal Husbandry.

Results

The results of our work indicate that stress factor that caused the disorder of functional homeostasis of animals and development of the stress reaction. The TAX effect manifested as an “adaptive factor”, contributing to a decrease of blood cortisol in experimental Groups 2&3 in comparison with the Control Group in the middle (93.5±16.2 & 133.7±16.6 vs. 147.6±27.5, nmol/l, $p<0.5$) and at the end of the experiment (234.4±61.2 & 253.2±46.4 vs. 284.8±86.8, nmol/l, $p>0.5$) (Fig. 2). Under TAX influence, the pigs’ antioxidant status improved, the concentration of lipid peroxidation products, i.e. blood TBARS decreased by 11.44 ($p<0.05$) and 11.80% ($p<0.01$) against the control group (2.40±0.12 & 2.39±0.08 vs. 2.71±0.05, µmol/l). The use of TAX improved ADG in the experimental groups (Week 1, Group 2, $p<0.05$; Week 8, Experimental Groups 2 and 3, $p<0.05$) in comparison with the Control Group. A more significant difference in ADG was observed in the final fattening period (1062.2±25.0 & 1049.9±19.9 vs. 1000.3±24.9, g, $p=0.01$), and in general, for the entire fattening period (120 days of experience), ADG was 887.9±13.2 & 881.6±15.8 vs. 865.2±12.0 g in Control ($p>0.5$). In the experimental groups, there was a tendency (75.2±0.4 & 74.8±0.2 vs. 73.9±0.4, %, $p<0.1$) to increase the digestibility of dry matter of feed at the end of fattening. Feeding TAX contributed to the retention of nitrogen through reduced excretion in the urine in the experimental groups (40.5±9.6 & 46.8±7.3 vs. 24.7±11.8, g, $p>0.05$).

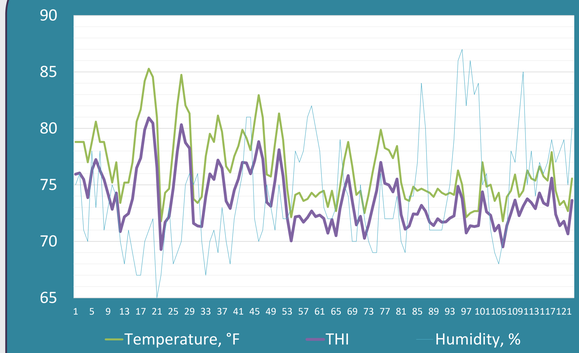

Fig. 1. Climatic indicators during the experiment

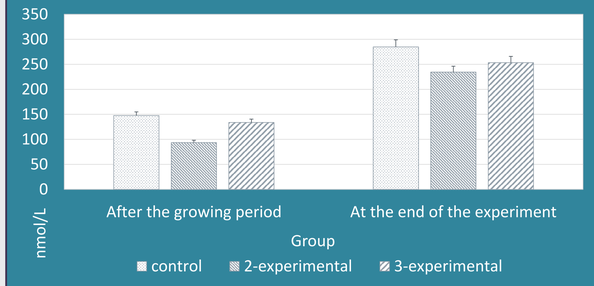

Fig. 2. The content of cortisol in the serum of pigs during the experiment

Conclusion

Thus, the fact of greater exposure to the climatic stress factor of the animals of the control group, expressed in the deterioration of growth parameters, the safety of livestock, and the use of feed nutrients, was noted. At the same time, the feeding of TAX (various course schemes during the rearing and fattening periods) had a significant impact on improving the adaptive abilities of the animals, which led to an improvement in their growth, caused by increased digestibility and deposition of nutrients in their body.

Consequently, stressors prevention by using natural antioxidants (bioflavonoids) is justified.

Taxifolin, preventing negative effects of heat stress, improves animal productivity.

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