

# THE EFFECT OF JERUSALEM ARTICHOKE ON GUT MORPHOLOGY AND MICROBIOLOGY OF BROILER CHICKENS

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**Introduction.** Feed additives such as prebiotics can modulate the gut microflora and performance of broiler chickens. Jerusalem artichoke (JA) contains some healthy-promoting components from which carbohydrates are the main component and the dominant fructooligosaccharide is inulin.

**The aim** of this work is to evaluate the effect of Jerusalem artichoke supplementation on intestinal morphology and microbiology of broiler chickens.

## Methods.

Three hundred, one-day-old cross ROSS 308 broiler chickens were randomly allocated into trial and divided in three groups of 100 birds each. The birds in the control group (CG) were fed with the commercial basic feed for cross ROSS 308 birds. Basic feed ration of the first group (G1) chickens was supplemented with 0.5% JA in dry form, but for the second group (G2) - with 1% concentration. Two birds from each group were euthanized by cervical dislocation at trial

beginning in 7<sup>th</sup>, further - 28<sup>th</sup> and 42<sup>nd</sup> days of age. Segments two centimeter long were taken from the central part of duodenum and ileum and fixed in 10% buffered formalin. Formalin-fixed intestinal tissues were processed, embedded in paraffin wax, sectioned and stained by the haematoxylin and eosin methods. The height of the villi, thickness of *lamina propria* and epithelium, and the depth of the crypts were measured with a microscope with an ocular micrometer. Content of ileum were bacteriologically tested for counts of *Lactobacillus* spp. and *Enterobacteriaceae* employing complex, selective and chromogenic culture media.

## Results.

Focal inflammation was observed in villi mucosa of duodenum at 28<sup>th</sup> day of age and this process was also revealed in *lamina propria* of small intestine at 42<sup>nd</sup> day of chickens' age. Focal inflammation was observed in villi mucosa of ileum of chickens at 42<sup>nd</sup> day of age. Mucosal architecture in terms of villus height and crypt depth in duodenum of G1 and G2 broilers were not significantly influenced by Jerusalem artichoke consumption in comparison to CG. The highest villi were in G2 duodenum (1799µm) and the lowest being in G2 ileum (636µm) at 42<sup>nd</sup> day. Villus height in the ileum was greatest in G1 (64µm) and in G2 (31µm) as compared to controls (21µm). In the ileum, crypt depth width was greater in the control group (47µm), but no significant differences were found between other groups. and in the duodenum. Results confirm that feed supplementation with 0.5% JA had significant effect on microstructure and mucosa of ileum.

It was established that at the age of 42 days in G1 group *ileum* content *Lactobacillus* counts were 1.75 times higher than in G2 group *ileum* content and reached 9.1 log kvv g<sup>-1</sup> (Fig.7).

## Discussion.

Changes in intestinal morphology, such as shorter villi and deeper crypts have been associated with the higher tissue turnover (Miles et al., 2006). In the study, no increase in duodenal or ileal villus height in chickens (fed with Jerusalem artichoke) were found compared to control. Jerusalem artichoke in 0,5% additive increase crypt depth, that indicates rapid tissue turnover and a high demand for new tissue. Demand for energy and protein for gut maintenance is high compared with other organs (Schneeman, 1982).

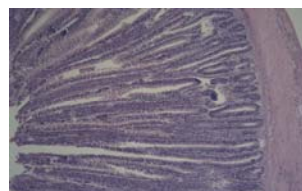


Fig.1. Section of duodenum villi of 7 days old broiler chicken H&E, 100X

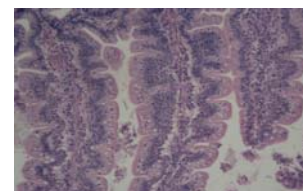


Fig.2. Section of ileum villi of 7 days old broiler chicken H&E, 200X

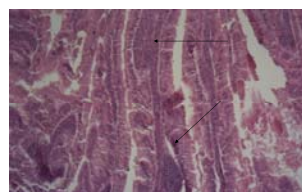


Fig.3. Lymphocytes infiltration in 28 days old broiler chicken duodenum villi (fed with 0,5% JA), H&E, 100X

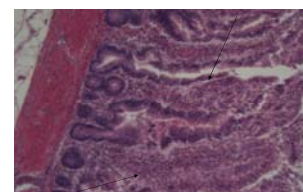


Fig.4. Lymphocytes infiltration in 28 days old broiler chicken ileum villi (fed with 0,5% JA) H&E, 100X



Fig.5. Feed supplementation with 1% JA had significant effect on microstructure and mucosa of duodenum in 42 old broiler chicken, H&E, 100X

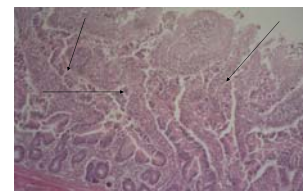


Fig.6. Feed supplementation with 1% JA had significant effect on microstructure and mucosa of ileum in 42 old broiler chicken, H&E, 100X

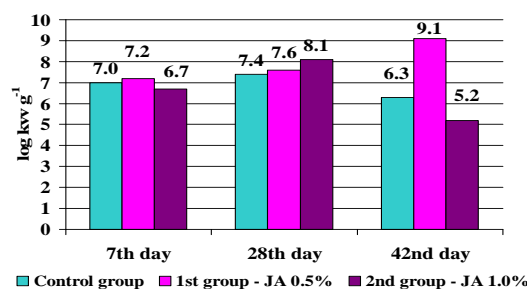


Fig.7. *Lactobacillus* counts in ileum content of broilers'

## Conclusion.

Jerusalem artichoke revise intensive regeneration ability for intestine mucosa. Feed supplemented with Jerusalem artichoke in dry form in 0.5% concentration had good effect on microstructure and mucosa of small intestine and on lactic acid bacteria in comparison with additive in 1% concentration.