EFFECT OF *PLEUROTUS OSTREATUS* COLONIZED SUBSTRATE ON BROILER CHICKEN GROWTH

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ABSTRACT

Alternative compounds have been used in ethnoveterinary to enhance growth performance and/or prevent common bacterial infections to poultry. However few of them have used mycelial-colonized substrate to partially replace standard diet in broiler chickens. The objective of this study was to evaluate broiler chicken production with partial replacement of standard diet by *Pleurotus ostreatus*-colonized substrate. The replacement of the standard diet by 100 and 200 g kg^{-1} (P100 and P200) of colonized substrate for 21-day-old chickens presented up to 35% and 40% higher feed intake ($p \leq 0.05$), respectively, than the control. For body mass of P100 and P200, it was 50% and 58% higher ($p \leq 0.05$), respectively, than control for 21-day-old. The use of *P. ostreatus*-colonized substrate in chicken feeding is an alternative to improve broiler chicken production.

Keywords: *Pleurotus ostreatus*, broiler performance, chicken diet, basidiomycota.

INTRODUCTION

Some basidiomycetes are known for their immunomodulating, antimicrobial and antitumor activity [1] and could be an alternative to improve poultry production. Alternative compounds have been used in ethnoveterinary to prevent common bacterial infections to poultry and/or enhance growth performance [2]. Poultry industry has improved the investments on animal health by using sub-therapeutic levels of antibiotic for subclinical disease control despite of people have been infected with bacteria that are resistant to those antibiotics [3].

Pleurotus ostreatus (Jacq.) P. Kumm. (Basidiomycota, Agaricales, Pleurotaceae) produce edible mushrooms recognized as a functional food due to its biological activity in the immunological system [4]. Different sources of fungi have been used on chicken production such as spent substrate from the cultivation of *Pleurotus sajor-caju* [5] or *Agaricus blazei* [6]; mushrooms from *Agaricus bisporus* [7] and mushroom extracts from *Lentinula edodes* and *Tremella fuciformes* [8]. However, the use of spent substrate from mushroom production has disadvantages for chicken feeding because of the reduced nutritional value and contaminating microorganisms that produce mycotoxins, common at the end of the mushroom cultivation and not always visible. The use of mushrooms or their extracts have a high production cost [5, 6], limiting their use for chicken feeding.

The use of vegetative mycelium grown in the feed itself has been little reported for chicken feeding [9], and presents the advantage of having the same biocompounds produced by mushrooms [4]. Moreover, mycelium production can be done in a shorter time, with high control of the cultivation [4], and is an alternative for chicken feeding. In addition *P. ostreatus* is a laccase producer, an enzyme widely used for hydrolysis of lignin, facilitating exposure and access to nutrients [10]. Thus, the objective of this study was to evaluate broiler chicken production with partial replacement of the standard diet by *P. ostreatus*-colonized substrate.

MATERIALS AND METHODS

P. ostreatus from the culture collection of *Paranaense* University, cryopreserved at – 20 °C was used as inoculum for the experimental phases [11]. *P. ostreatus*-colonized substrate was used for partial replacement of standard diet for feeding from zero-to-21-day-old chickens.

This study was approved by the Ethics Committee of Research with Animal Experimentation of *Paranaense* University. 150 one-day-old male Cobb chicks were randomly distributed into five treatments. Each treatment had three replicates, with 10 birds per replicate per box, totalizing 30 birds. Each box had 1.5 m x 1.5 m with wood shavings on a concrete pad. The experimental groups were fed standard diet partially replaced by *P. ostreatus*-colonized substrate. Standard diet replacement was of 5, 10, 100 or 200 g kg^{-1} of *P. ostreatus*-colonized substrate,

Feed intake and body mass of poultry production were recorded on the 21st day. The feed conversion ratio was calculated by the feed intake divided by the body mass gain. Chickens were slaughtered by cervical dislocation with monitoring of the local Sanitary Surveillance Agency to allow consumption of approved carcasses at the university restaurant. The results were submitted to analysis of variance and differences among averages were determined by Scott-Knott's test with significance level at 5%.

RESULTS AND DISCUSSION

Broiler chicken production

Treatments P100 and P200 for 21-day-old chickens presented up to 35% and 40% higher feed intake ($P < 0.05$), respectively, than the control. For body mass of P100 and P200, it was 50% and 58% higher ($P < 0.05$), respectively, than control for 21-day-olds. In conclusion, the replacement of *P. ostreatus*-colonized substrate in standard diet is effective for chicken body mass gain and production. Body mass gain increases when replacement in standard diet is higher than 10 g kg^{-1} of colonized substrate. Feed conversion ratio is more effective for 21-day-old chicks when the replacement of the standard diet is 100-200 g kg^{-1} of colonized substrate.

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REFERENCES

[1] Gunde–Cimerman N.(1999). Medicinal value of the genus *Pleurotus* (Fr.) P. Karst.(Agaricales s. l., Basidiomycetes). *Int. J. Med. Mushrooms*.1(1): 69–80.

[2] Guo FC *et al*. (2004). Effects of mushroom and herb polysaccharides on cellular and humoral immune responses of *Eimeriatenella*–infected chickens. *Poult Sci*. 83(7): 1124–1132.

[3] Aarestrup FM. (2000). Occurrence, selection and spread of resistance to antimicrobial agents used for growth promotion for food animals in Denmark. *APMIS Suppl*.108(S101): 5–48.

[4] Miles PG and Chang ST. (1992). Mushroom Biology: concise basics and current developments. Singapore: *World Scientific* 1997.

[5] Azevedo RS *et al*. (2009). Utilization of the spent substrate of *Pleurotus sajor-caju* mushroom in broiler chicks ration and the effect on broiler chicken performance. *Acta Sci. Anim Sci*. 31(2): 139–144.

[6] Machado AMB *et al*. (2007). Spent mushroom substrate of *Agaricus blazei* in broiler chicksdiet. *R.Bras.Zootec*. 36 (4): 1113–1118.

[7] Giannenas I *et al*. (2011). Consumption of *Agaricus bisporus* mushroom affects the performance, intestinal microbiota composition and morphology, and antioxidant status of turkey poults. *Anim. Feed. Sci. Technol*. 165(3):218–229.

[8] Guo FC *et al*. (2004). Effects of mushroom and herb polysaccharides, as alternatives for an antibiotic, on the cecal microbial ecosystem in broiler chickens. *Poult. Sci*. 83 (2): 175–182.

[9] Willis WL *et al*. (2010). Effect of dietary fungus myceliated grain on broiler performance and enteric colonization with *Bifido bacteria* and *Salmonella*. *Int. J. Poult. Sci*. 9(1): 48–52.

[10] D'Agostini EC *et al*. (2011). Low carbon/nitrogen ratio increases laccase production from basidiomycetes in solid substrate cultivation. *Sci. Agric*. 68(3): 295–300.

[11] Mantovani TRD *et al*. (2012). Cryopreservation at –20 and –70 ºC of *Pleurotus ostreatus* on grains. *Indian J. Microbiol*. 52(3): 484–488.