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Fermented pollen of indigenous stingless bee as an alternative food aditive to improve growth and immune response of tambaqui.

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INTRODUTION & OBJETIVE

Tambaqui (*Colossoma macropomum*) is the native species most produced native species in Brazil, occurring naturally in the Amazon and Orinoco river basins. (Gomes et al., 2020). As it is a rustic species and resistant to fish farming, it has excellent potential for intensive production.. However, the intensification of production causes fish to be exposed to stressful situations that end up reducing their immunocompetence, leaving them vulnerable to deases. (Urbinati et al., 2020). Factors linked to the health and nutritional status of the species reinforce the need for alternatives to diet formulations. In this sense, fermented pollen (FP) from stingless bees is an excellent alternative for improvement in aquaculture diets due to its ability to strengthen the immune system through the antioxidant action of bioactive compounds and its antimicrobial, anti-inflammatory, antifungal, hepatoprotective and chemopreventive (Abdelnour et al., 2018). Therefore, the aim of this study was to evaluate the inclusion of FP from *Melipona seminigra merrilae* in the growth performance and immune responses of tambaqui.

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METHODS

144 fish
(18,42 ± 3,8 g)

Water recirculation system and complementary aeration
12 fish/200L-tank)

Fed for 15 days, twice a day (3% of biomass) with FP-free diet (control), 2% and 3% FP to the experimental diet.

After 15 days of experiment, 3 animals from each tank were sampled and subjected to anesthesia to **calculate weight gain and blood collection**.

Blood samples were used to determine **plasma glucose levels, leukocyte respiratory activity and globulin**.

Data were analyzed for normality and homoscedasticity of variances, weight gain was submitted to linear regression and metabolic and immunological parameters were submitted to ANOVA, followed by Tukey's test ($P < 0.05$).

RESULTS & DISCUSSION

- The results pointed to a linear trend in improving weight gain as the inclusion of FP in the diet increases (Figure 1). The same was observed in the works by El-Asely et al. (2014) and Abbas et al. (2012), in which 2.5% of *Apis* bee pollen in Nile tilapia (*Oreochromis niloticus*) diet improved specific growth rate, feed efficiency and weight gain. This can be attributed to bee pollen components such as vitamins, minerals and enzymes or coenzymes, which increase food digestion and assimilation.

- The metabolic parameters showed that there was a decrease in plasma glucose in the groups with inclusion of 2% fermented pollen in the diet when compared to the control group. While the respiratory activity of leukocytes and globulin were higher in fish fed with 2% FP, compared to the control treatment (Table 1). The results corroborate Soror et al. (2021) and El-Asely et al. (2014), who found the same significant increase in globulin levels and increase in the number of phagocytic cells in an NBT (Nitroblue tetrazolium) assay in tilapia fed 2.5% pollen, respectively. These results are evidence of immunostimulation in the non-specific immune system of these animals and the effects may be related to more than 20 phenolic compounds secreted by bees by the hypopharyngeal glands and incorporated into pollen during fermentation (Abdelnour et al., 2018).

- There are no reports in the scientific literature that explain how pollen can modulate glucose in fish. However, a possible explanation may be related to the symbiotic microorganisms present in the stingless bee colony that ferment and conserve pollen in cerumen pots, such as *Lactococcus* and *Lactobacillus*, which act as a probiotic in various living organisms (De Paula et al., 2021). It was observed by Rebelo et al. (2021) that in diabetic and obese mice stingless bee pollen can reduce insulin resistance and regulate hyperglycemia.

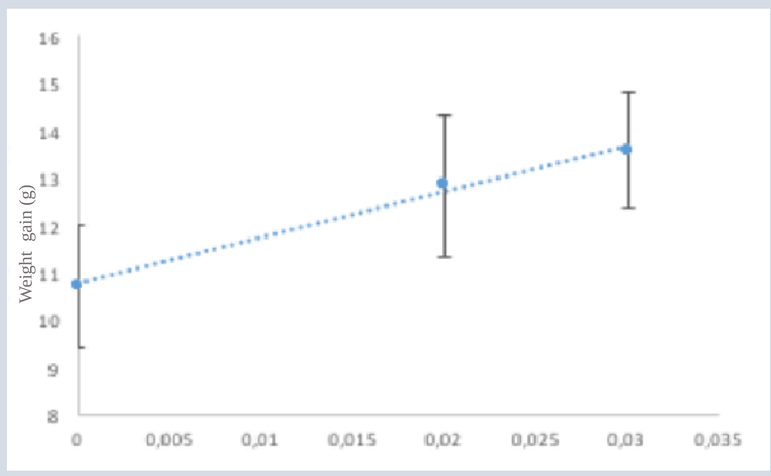

Figure 1. Linear regression of weight gain of juveniles of tambaqui (*Colossoma macropomum*) fed FP stingless bee (y= 97,218x + 10,754, R^2= 0,99).

Table 1. Values of plasma glucose, leukocyte respiratory activity and globulin from juveniles of tambaqui (*Colossoma macropomum*) fed FP from stingless bees.

Treatments	Plasma glucose (mg/dL)	Leukocytes respiratory activity	Globulin (g/dL)
Control diet	42,1 ± 2,87 a	0,297 ± 0,02 b	2,26 ± 0,06 b
2% Fermented pollen	37,95 ± 2,02 b	0,311 ± 0,01 a	2,64 ± 0,14 a
3% Fermented pollen	38,99 ± 2,08 ab	0,300 ± 0,01 ab	2,44 ± 0,13 ab

CONCLUSION

In the present study, it can be concluded that the incorporation of 2% fermented pollen from stingless bees in the diet improves growth performance and immune response in tambaqui.

REFERENCES

Abbass, A. A.; El-Asely, A. M.; Kandiel, M. M. M. 2012. Effects of Dietary Propolis and Pollen on Growth Performance, Fecundity and Some Hematological Parameters of *Oreochromis niloticus*. Turkish Journal of Fisheries and Aquatic Sciences, 12: 851-859.

Abdelnour, S. A.; El-Hack, M. E. A.; Alagawany, M.; Farag, M.; Elnesr, S. 2019. Beneficial impacts of bee pollen in animal production, reproduction and health. Journal of Animal Physiology and Animal Nutrition,103:477-484.

De Paula, Gabriela Tortinato; Menezes, Cristiano; Pupo, Mônica Tallarico; Rosa, Carlos Augusto. 2021. Stingless bees and microbial interactions. Current Opnions in Insect Science, 760: 1-7.

El-Asely, A. M.; Abbass, A. A.; Austin, B. 2014. Honey bee pollen improves growth, immunity and protection of Nile tilapia (*Oreochromis niloticus*) against infection with Aeromonas hydrophila. Fish and Shellfish Immunology, 40: 500-506.

Gomes, L. de C.; Simões, L. N.; Araújo-Lima, C. A. R. M. 2020. Tambaqui (*Colossoma macropomum*). In: Baldisserotto, B. (Org). Espécies Nativas para Piscicultura no Brasil. 3ª edição. UFSM. Santa Maria, Rio Grande do Sul. p. 147-162.

Rebelo, Kemilla S.; Cazarin, Cinthia BB; Iglesias, Amadeu H.; Stahl, Marcella A.; Kristiansen, Karsten; Carvalho-Zilse, Gislene A.; Grimaldi, Renato; Reyes, Felix GR.; Júnior, Mário RM. 2021. Nutricional composition and bioactive compounds of *Melipona seminigra* pot-pollen from Amazon, Brazil. Journal Science Food Agriculture, 1-9.

Soror, Eman I.; El-Asely, Amel M.; Gawad, Eman A. Abdal; Radwan, Hasnaa A.; Abbas, Amany A. Recuperative effects of honey bee pollen, ginger (*Zingiber officinalle*) and *Moringa oleífera* in Nile tilápia (*Oreochromis niloticus L.)* after sub-lethal exposure to dimathoate. Aquaculture, 530: 735886.

Urbinati, E. C.; Zanuzzo, F. S.; Biller, J. D. 2020. Stress and immune system in fish. In: Baldisserotto, B.; Urbinati, E. C.; Cyrino, J. E. P. (eds). Biology and Physiology of Freshwater Neotropical Fish. Elsevier, Academic Press. p. 93-144.

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