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***Bacillus subtilis* as probiotic candidate for red sea bream: growth performance, oxidative status, and immune response traits**

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**Abstract**

The effects of dietary administration of *Bacillus subtilis* on the growth, digestive enzyme activity, blood chemistry, oxidative status and immune response of red sea bream (*Pagrus major*) were evaluated in the current study. Fish fed five different levels of *B. subtilis* at 0 (BS0),  $1 \times 10^4$  (BS1),  $1 \times 10^6$  (BS2),  $1 \times 10^8$  (BS3) and  $1 \times 10^{10}$  (BS4) CFU kg<sup>-1</sup> diet for 60 days. The obtained results showed that *B. subtilis* supplementation significantly improved growth performance (FBW, WG and SGR), feed utilization (FI, FCE, PER and PG) and whole-body protein content when compared to the control group ( $P < 0.05$ ). Furthermore, the specific activities of amylase, protease and lipase enzymes up regulated significantly upon *B. subtilis* incorporation in red sea bream diets ( $P < 0.05$ ). No changes have been reported on blood biochemical variables except for the plasma total protein, which increased significantly in fish fed BS3 diet when compared with the control diet ( $P < 0.05$ ). Hematocrit, hemoglobin and the nitro blue tetrazolium values also reported the highest values significantly in fish fed *B. subtilis*, especially in case of BS3 and BS4 diets ( $P < 0.05$ ). Serum bactericidal activity enhanced significantly in BS2, BS3 and BS4 groups ( $P < 0.05$ ), while mucus bactericidal activity showed no significant activity among tested groups ( $P > 0.05$ ). Serum lysozyme activity exhibited higher values in

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