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Interaction of dietary *Bacillus subtilis* and fructooligosaccharide on the growth performance, non-specific immunity of sea cucumber, *Apostichopus japonicus*

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Abstract

A feeding experiment was conducted to investigate the interaction of probiotic *Bacillus subtilis* and prebiotic fructooligosaccharide (FOS) on the growth performance, immunity, intestinal microflora and disease resistance of sea cucumber (*Apostichopus japonicus*). Five hundred and forty individuals (initial body weight: 5.06Â Â±Â 0.10Â g, meanÂ Â±Â S.E) were fed nine practical diets according to a 3Â Ã—Â 3 factorial design: the basal diet asÂ the control diet supplemented with three levels of *B. subtilis* (0, 1.82Â Ã—Â 10^7 or 4.95Â Ã—Â 10^7Â CFUÂ $g^{â^{'}1}$ diet), crossed with 0, 0.25% or 0.50% FOS. After 8 weeks, three sea cucumbers per tank were sampled for bacterial

quantification and immunity determination. Then all the sea cucumbers left were challenged by *Vibrio splendidus*. The results showed that dietary *B. subtilis* significantly increased the specific growth rate (SGR), total coelomocytes counts (TCC), phagocytosis of sea cucumbers, the counts of total viable bacteria and disease resistance to *V. splendidus* (PÂ <Â 0.05), whereas the counts of *Vibrio* decreased. However, dietary *B.Â subtilis* had no significant effect on phenoloxidase (PO) activity in coelomocyte lysate supernatant (CLS) (PÂ >Â 0.05). The SGR, PO activity, total viable bacterial counts (TBC) and *Vibrio* counts (VBC) were significantly affected by dietary FOS. In the group with 0.50% FOS, TCC, phagocytosis and PO activity significantly increased compared to the group fed without FOS in diet (PÂ <Â 0.05). In the groups with 1.82Â Ã—Â 10^7Â CFU *B.Â subtilis*/g diet, FOS supplementation remarkably decreased VBC. And higher level of FOS (0.50%) resulted in significantly higher TCC and PO activity compared with 0.25% FOS (PÂ <Â 0.05). Moreover, the animals fed with diets supplemented with 0.25% and 0.50% FOS at each *B. subtilis* level had notably lower cumulative mortality after 14 days following *V. splendidus* exposure (PÂ <Â 0.05). Under the experimental conditions, dietary *B. subtilis* and FOS had a synergistic effect on enhancing immunity and disease resistance of sea cucumber (PÂ <Â 0.05).

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Keywords

Apostichopus japonicus; Probiotic; Prebiotic; Growth; Immunity; *Vibrio splendidus*

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