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***Scoparia dulcis* L. Extract Relieved High Stocking Density-Induced Stress in Crucian Carp (*Carassius auratus*)**

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**Abstract:**

**Background/Objective:** High stocking density is a typical inducers of physiological stress in fish. It is well known that the stress response may be harmful to aquatic animals, inhibiting growth, causing reproductive failure, and reducing resistance to pathogens. Hence, it is important to attenuate the detrimental effects induced by these stressors in modern farming systems. Although *Scoparia dulcis* relieved cadmium-induced oxidative stress in rats, little information is available on the effects of high stocking density in fish. Therefore, this study investigates the protective effects of dietary supplementation with *Scoparia dulcis* extract on fish maintained at a high stocking density.

**Methods:** *Scoparia dulcis* extract (SDE) was prepared first. Juvenile crucian carp (8.3 ± 0.3 g) were randomly assigned into eight groups, each of which contained 4 replicate aquariums. Group one (control) contained 15 fish per aquarium (normal density, 0.48 fish L-1), while the other groups contained 30 fish per aquarium (high density, 0.97 fish L-1). The basal diet was fed to the control group, and experimental diets supplemented with AE at 0.0, 1.0, 2.0, 3.0, 4.0, 5.0, and 6.0 g kg-1 were fed to groups two to eight for 60 days. Fish growth performance, digestive activities and antioxidant status were detected.

**Results:** The results showed that high stocking density exerted detrimental effects in fish, such as inhibition of growth performance. Under high stocking density, dietary SDE supplementation increased the content of reduced glutathione (GSH) and the activities of amylase, catalase (CAT), and glutathione reductase (GR) and decreased the content of malonaldehyde (MDA) in the intestine of crucian carp. The optimum dietary SDE supplementation levels was 4.07 g kg1 diet based on the recovery rate of weight gain (RWG) for crucian carp under high stocking density

**Conclusion:** Dietary supplementation with SDE may be a useful welfare strategy for relieving these stresses in aquatic animals.

**Keywords:** fish welfare; growth performance; digestive ability; antioxidant status