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池塘微孔曝气和叶轮式增氧机的增氧性能比较

Comparison of oxygen-enriched performances of micropore and impeller aerators in pond

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作者	单位
谷 坚	1. 农业部渔业装备与工程重点开放实验室，上海 2000922. 中国水产科学研究院渔业机械仪器研究所，上海 200092
徐 皓	1. 农业部渔业装备与工程重点开放实验室，上海 2000922. 中国水产科学研究院渔业机械仪器研究所，上海 200092
丁建乐	2. 中国水产科学研究院渔业机械仪器研究所，上海 200092
车 轩	1. 农业部渔业装备与工程重点开放实验室，上海 2000922. 中国水产科学研究院渔业机械仪器研究所，上海 200092
顾兆俊	1. 农业部渔业装备与工程重点开放实验室，上海 2000922. 中国水产科学研究院渔业机械仪器研究所，上海 200092

中文摘要:

为研究池塘养殖中微孔曝气与叶轮式增氧机的增氧性能，用2种增氧机在清水池和鱼类养殖池塘中进行了增氧性能和溶氧值变化的比较研究。结果表明，在清水池中，微孔曝气的增氧能力、动力效率分别高出叶轮式增氧机82%和84%；而在鱼塘中，叶轮式增氧机对整个池塘的平均溶解氧增加值比微孔曝气高94%，且叶轮式增氧机对池塘水体有比较好的混合能力，缩小水层氧差能力比微孔曝气高出45.7%。研究表明在本鱼塘试验中，目前叶轮式增氧机是比同等功率配置的微孔曝气更合适的增氧方式。

英文摘要:

Abstract: In high stocking density closed pond aquaculture, the farmed fish will suffer death from suffocation if no additional oxygen is supplied. Currently, there are various kinds of aeration methods in China, mainly including the types of impeller, water wheel, jet, propeller, and micropore aerator. The micropore aeration as the main form of bottom aeration method has been becoming one of the main aeration methods applied and expanded in China pond aquaculture in recent years. This study aimed at a systematic comparative analysis on the aeration effect and practical usage between a micropore aerator and an impeller aerator that has the best comprehensive performance and currently holds the dominant position in mechanical aeration in China, through a clean water test and a fishpond experiment. In order to study the oxygen-enriched performance of a micropore aerator and an impeller aerator in pond fish culture, we conducted the clean water oxygen-enriched performance test with the same power (2.2 kW) micropore aerator and an impeller aerator in the standard tank with a diameter of 10 meters according to the requirements described in the fisheries industry standard-"SC/T 6009-1999, the test method of oxygen-enriched capacity for aerator." According to the experiment requirements, the tap water which was kept for a period was deoxidized using sodium sulfite (Na2SO3), and then was aerated again, while the time-variable data of dissolved oxygen (DO) concentration were measured and recorded. The oxygen-enriched capacity (Qs) and power efficiency (Es) were calculated for the impeller aerator and the micropore aerator with the obtained experiment data. The comparative experiments of actual oxygen-enriched performance and pond dissolved oxygen values variation for both aerators were conducted in a fishpond. One micropore aerator (combined with a 2.2 kW blower, 8 35-metre-long pipes were arranged in parallel with 10-meter intervals at the bottom of fish pond, the total pipe length is 280 meters.), and one 2.2 kW impeller aerator (placed at the centre of fish pond) were installed in the same fish pond. The analysis carried out with the oxygen mass transfer theory and the Fick's Law, combined with the actual aeration data, showed that the oxygen-enriched capacity and power efficiency of the micropore aerator was 82% and 84% higher than those of the impeller aerator, respectively. The oxygen-enriched capacity of a micropore aerator is better than that of an impeller aerator. However, in a fishpond, the whole pond average dissolved oxygen increment of the impeller aerator was 94% higher than that of the micropore aerator, and the impeller aerator showed a better mixing ability to pond water in the experiment. The results showed that the impeller aerator can work better to improve the whole pond dissolved oxygen levels and to reduce the oxygen difference among water layers, and the oxygen difference variance ratio between the upper layer and the lower layer in the pond that used an impeller aerator for aeration is 45.7% higher than a micropore aeration. The study findings from the fishpond experiments demonstrated that, in a fishpond in which the effective water depth is not lower than 1.5 m, an impeller aerator is more suitable for aeration in the case of the same power configuration of above-mentioned two types of aerators.

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