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USE OF BASIDIOMYCETE AND ASCOMYCETE REPRESENTATIVES FOR REMOVAL OF ACID AND METAL-COMPLEX DYES FROM NATURAL TEXTILE WASTEWATER

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Introduction

The textile industry is a major contributor to environmental pollution, particularly through the discharge of wastewater containing acid and metal-complex dyes. Basidiomycetes and Ascomycetes fungal representatives are known for their enzymatic capabilities, including ligninolytic and peroxidase activities, which enable them to degrade a wide range of organic pollutants. By harnessing the enzymatic "machineries" of these strains, efficient degradation and removal of acid and metal-complex dyes from wastewater can be achieved. *Cerioporus squamosus*, commonly known as the dryad's saddle, is a widespread polypore fungus found on hardwood trees. Its fruiting bodies can be quite large and are typically seen growing in overlapping clusters on logs or stumps. *Fusarium oxysporum* is a soil-borne fungal pathogen that affects a wide range of plant species, causing wilt disease by invading the vascular system. This fungus is known for its ability to produce spores that spread easily through water, soil, and infected plant material, leading to significant agricultural losses worldwide. The main aim of the study was to test the bioremediation efficiency of these two strains against two types of worldwide use textile dye, namely Nylosan Blau EBL and Lanasyn Marine Blau SD-NL, which is a novelty at least at national level.

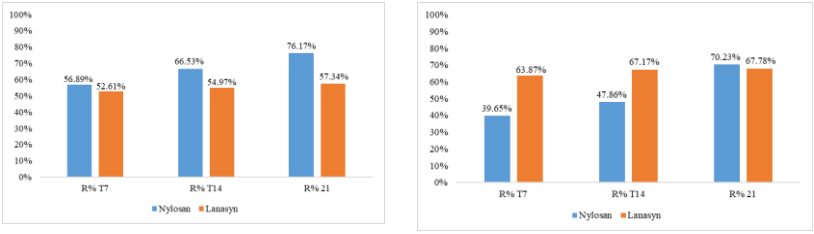
Materials and methods

The bioremediation experiments started from obtaining fresh biomass of *F. oxysporum* and *C. squamosus*, and two sources of wastewater were treated, following textile materials dyeing, with Nylosan Blau EBL and Lanasyn Marine Blau SD-NL dyes. In the bioremediation process, in order to maintain the nutrient supply necessary for the growth and enzymatic expression of the microbial strains, growth salts were added to each sample: $NaNO_3$, KH_2PO4, K_2HPO_4, KCl, $MgSO_4$ x $7H_20$, $FeSO_4$. The samples were continuously kept in a shaking incubator at 110 rpm, 28ºC. This incubation method was preferred over the static one to avoid growth of the fungal biomass on the surface of the medium versus growth in volume (forced by continuous shaking of the strain in the medium). This ensured the proliferation of the fungal biomass in the entire liquid volume. The samples were incubated for 3 weeks with UV-VIS readings to detect the dye concentration in solution at the start of the experiments (T0), 7 days (T7), 14 days (T14) and 21 days

(T21). UV-VIS spectrophotometry was used to calculate the degree of reduction of the dye concentration in solution for each sample.

Results and conclusions

The present work explored the biodegradative potential of two fungal strains, namely *Cerioporus squamosus* and *Fusarium oxysporum*, towards the reduction of residual concentrations of Nylosan Blau EBL 200% (acid dye) and Lanasyn Marine Blau SD-NL (metal-complex dye) in natural wastewaters obtained after textiles dyeing processes. Multiple spectrophotometric determinations were performed on samples, both at the initial time (T0, prior to inoculation with strains) and at T7 (7 days), T14 (14 days) and T21 (21 days). The reduction rates of the residual concentration of each dye are presented in Figure 1, and were calculated relative to the same sample, read at T0 (considered as control), before starting the bioremediation experiments.



Fusarium oxysporum *Cerioporus squamosus*

Figure 1. Reduction rates of *F. oxysporum* and *C. squamosus* against Nylosan and Lanasyn dyes, compared at 7, 15 and 21 days (end of the experiment)

Results showed good reduction rates of residual dyes concentrations in solutions of the two tested strains, with maximum rates achieved against Nylosan dye (76.17% for *Fusarium oxysporum*, and 70.23% for *Cerioporus squamosus*) compared to Lanasyn dye (57.34% for *Fusarium oxysporum*, and 67.78% for *Cerioporus squamosus*). The results show good efficiency of the testes strains against the selected textyle dyes, promoting the use of these fungi as viable bioremediation solutions in the textile industry wastewater treatment.

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