Oil vesicles in Mortierellales – spatial investigation by means of Raman micro-spectroscopy

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Fungi of the genus *Mortierella* are known to produce oil vesicles in various amounts within their hyphae. These oils often are rich in various polyunsaturated fatty acids (PUFAs) and thus present a promising source for industrial exploitation of highly unsaturated long chain PUFAs. However, how or why the fungi produce these oil vesicles in the first place is still a matter of debate. Knowledge about the spatial distribution and composition may help to understand the role of the oil for the fungus. Unfortunately, the current method of choice for investigating these fungal oils consists in the extraction of the oil from the mycelium, hence naturally deleting all spatial information in the process. Raman spectroscopy on the other hand is a non-destructive technique that can provide information about the degree of unsaturation in lipids. [1, 2] Therefore we want to apply Raman micro-spectroscopy to spatially investigate single oil vesicles inside intact hyphae.

For these spatial investigations, hyphae of various *Mortierella* species were successfully grown onto microscopic slides. Single hyphae containing oil droplets were selected and Raman spectra of numerous oil vesicles were taken over the length of several hundreds of micrometres. From the spectra, information about the total degree of unsaturation was extracted. When comparing the values from different vesicles within one hypha no significant change could be observed. Also for different morphological structures (branching points, side branches, hyphal tips) the oil composition does not differ in the degree of unsaturation. Comparing measurements from different single hyphae of one sample, it appears that the oil is the same everywhere within one sample.

From the measurements it can be concluded that the oil produced by the fungus is of constant composition with regard to the degree of unsaturation. Morphology does not seem to effect either oil production or oil composition. Also no preference for the accumulation of the oils at specific sites of the hypha could be identified.

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References

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