Determination of the geographical origin of tropical timber by using an innovative traceability tool "PCR-DGGE"

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Timber is an important source of income for many tropical countries. The tropical forests are also the lifeblood of local and indigenous people, and contain a unique biodiversity. The advantage of most tropical timber is that it has a good natural durability, it is thus environmental friendly for the outdoor environment by avoiding impregnation with preservatives, etc. In addition, a lot of tropical timber has number of aesthetic qualities and great strength (1).
Traceability is defined according to the standard ISO 9000/2005 "the ability for the retrieval of the history and use or origin of an article or an activity through a registered method" (2). Their implementation in the timber industry is delayed because of the limits of classical identification systems in regard to the nature of timber and the features of the manufacturing processes.
For the first time, a method of fungi ecology, the PCR-DGGE was used as a new traceability analytical tool to identify the geographical origin of tropical timber from four countries (Ivory Coast, Cameroon, Central African Republic, Polynesia) by using the diversity of fungal communities present in timber samples.

Methodology
DNA extraction from fungi, we created a new protocol which takes into account the method of El Sheikha *et al.* (3). The efficiency of this protocol is suitable to extract the genomic DNA from all fungal species in a unique step without using purification kits and it is perform on a large number of samples in one analysis. Physical, chemical and enzymatic cell wall disruption and optimal extraction was achieved by incorporating acid washed glass beads, lysis buffer and enzymatic digestion step. DNA quality was confirmed by the successful PCR amplification which used for the first time a universal primer to amplify all fungal species in a unique PCR. The PCR products were analyzed by DGGE by using a Bio-Rad DcodeTM universal mutation detection system (Bio-Rad Lab., USA) using the procedure described by El Sheikha *et al.* (4).

Results
Efficiency of the new protocol for the extraction of fungi DNA from tropical timber, DNA extraction of the fungi community was done on the tropical timber samples using our new protocol which achieved admirable success (Fig 1).
Verification of the PCR amplification of the extracted DNA, fungal DNA was amplified by our novel PCR conditions. All of the bands were clearly observed (Fig 2).
DGGE pattern, the observed bands had sufficient intensities to analyze samples of fungal DNA extracted from tropical timbers from four various geographical areas (Fig 3).
Clusters and factorial correspondence analysis, we can observe clearly that the differences between the geographical locations depend on the diversity of the fungal communities of timber samples (Fig 4, 5).

Conclusion

We created a new molecular tool to assure the determination of geographical origin of timbers. The analysis of tropical timber fungal communities by PCR-DGGE could be applied to differentiate geographical locations and provide a unique biological bar code for timbers which make it possible to trace back the timbers to their original locations.

References

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