# Universal biological bar-code for determining the geographical origin of fruits by using PCR-DGGE


**A. F. El Sheikha[1,2*], D. Montet[2]**

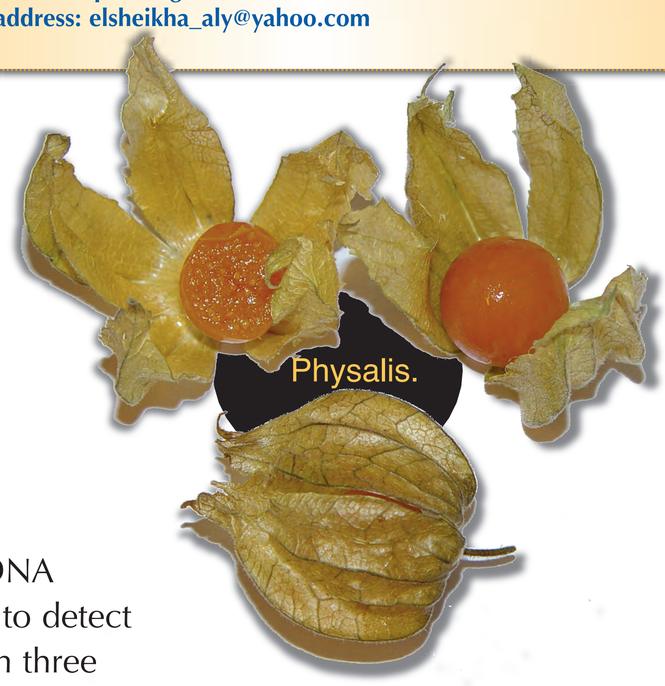
[1] Department of Food Science and Technology (Minufiya University, Faculty of Agriculture), 32511 Shibin El Kom, Egypt.

[2] UMR 95 Qualisud (CIRAD, Montpellier University II), 34398 Montpellier Cedex 5, France.

*** Corresponding author: A.F. El Sheikha**

**address: elsheikha_aly@yahoo.com**


*The determination of geographical origin is a demand of the traceability system of import-export foodstuff. One hypothesis of tracing the source of a product is by analyzing in a global way the microbial communities of the food and links statistically this analysis to the geographical origin of the food (1). Physalis is included in the priority list of many governments' horticulture and fruit export plan. It is exported from several countries including Colombia, Egypt, Zimbabwe and South Africa, but Colombia stands out as one of the largest producers, consumers and exporters. Colombia exports of Physalis in 2004 were worth 14 million USD (2). Shea tree fruits, only seven countries have statistics. Nigeria accounts for more than 60% of the production of Shea butter in 2005. It is followed by Mali, Ghana and Burkina Faso, which together account for just under a third of world production in 2005. In Europe, Shea butter is used mainly (95%) by the chocolate industry (3).*




## Methodology


- We applied an innovative molecular technique employing 28S rDNA profiles generated by PCR-DGGE as a new traceability technique to detect the variation in fungal community structures of Physalis fruits from three countries (Colombia, Uganda, Egypt) (4), and Shea tree fruits from three countries (Cameroon, Mali, Senegal) (5).
- This novel technique was created by El Sheikha et al. (4, 5) and take into account the method of El Sheikha et al. (1).

Fig. 1. PCR-DGGE 28S rDNA profiles of Physalis.

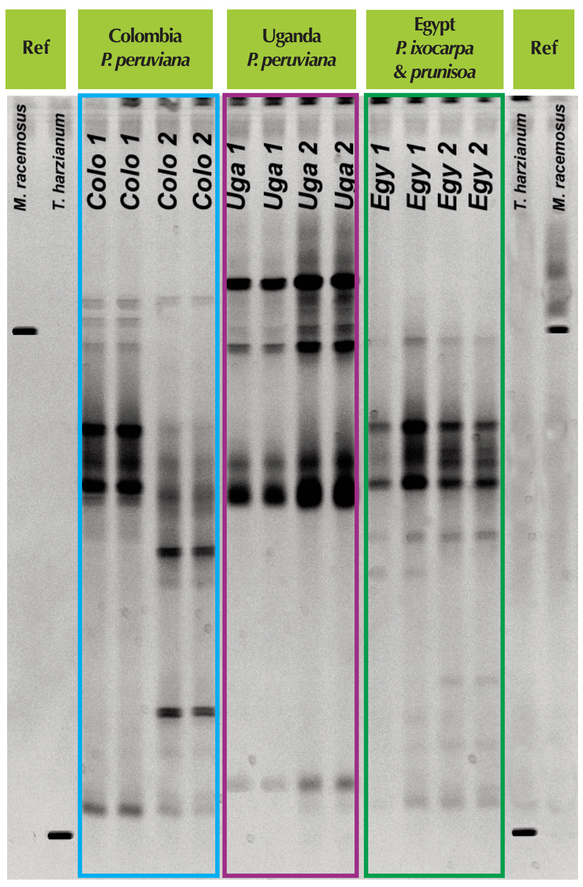
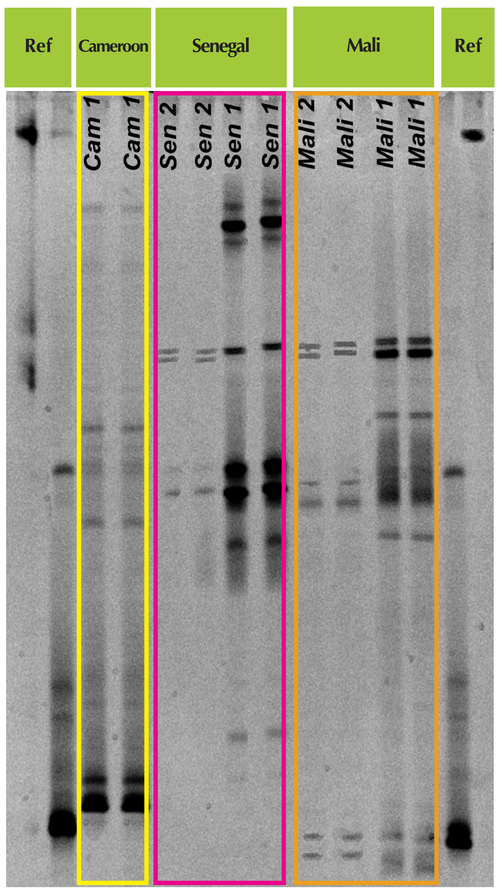



Fig. 2. PCR-DGGE 28S rDNA profiles of Shea tree fruits.




## Results

- The DGGE gels showed some significant differences in the migration patterns. However, the duplicates for each sampling location gave statistically similar DGGE patterns throughout the study (Fig. 1, Fig. 2).
- The band profiles from different countries were different and were specific for each country and could be used as a bar code to discriminate the origin of the fruits.
- When the 28S rDNA profiles were analyzed by multivariate analysis, distinct microbial communities were detected (Fig. 3, Fig. 4, Fig. 5, Fig. 6).

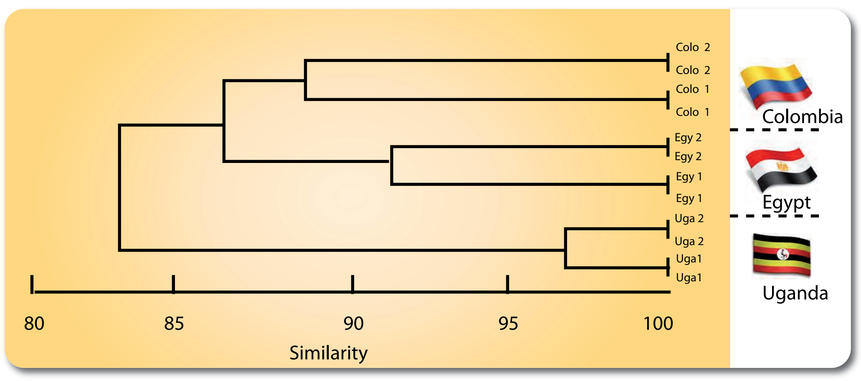



Fig. 3. Factorial variance analysis of 28S rDNA profiles of Physalis.

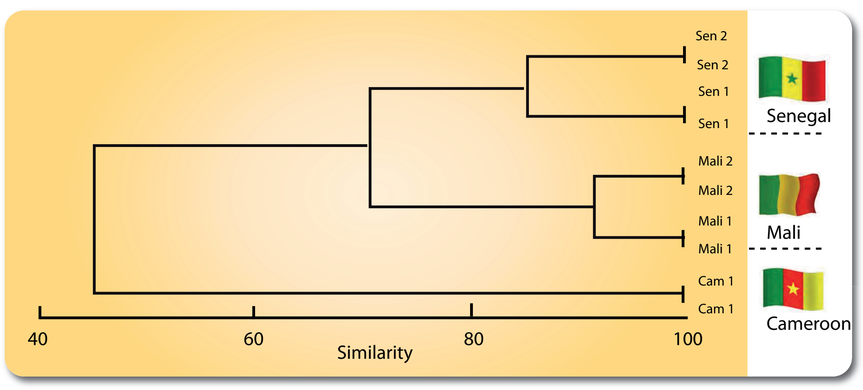



Fig. 5. Factorial variance analysis of 28S rDNA profiles of Shea tree fruits.

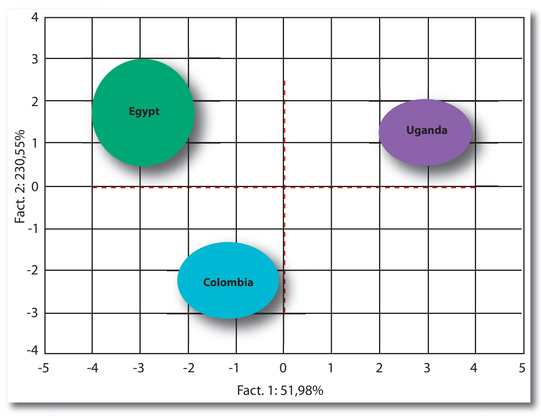



Fig. 4. Cluster analysis of 28S rDNA band profiles of Physalis.

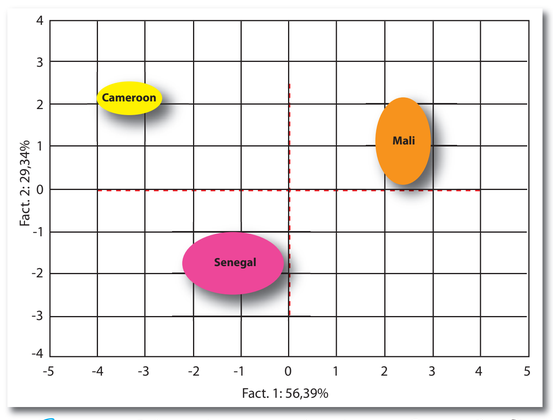



Fig. 6. Cluster analysis of 28S rDNA band profiles of Shea tree fruits.

## Conclusion

We demonstrated that there was a link between the fungi populations and the geographical area. This method is a new traceability tool which provides fruit with a unique bar code and makes it possible to trace back the fruits to their original countries.


References

1. El Sheikha, A.F., Condur, A., Métayer, I., Le Nguyen, D.D, Loiseau, G., Montet, D. (2009). **Determination of fruit origin by using 26S rDNA fingerprinting of yeast communities by PCR-DGGE: Preliminary application to Physalis fruits from Egypt.** *Yeast* **26 (10): 567-573.**

2. El Sheikha, A.F., Zaki, M., Bakr, A., El Habashy, M., Montet, D. (2008). **Physico-chemical properties and biochemical composition of Physalis (Physalis pubescens L.) fruits. Global Science Books Ltd., UK,** *FOOD* **2 (2): 124-130.**

3. UNCTAD. (2001). **United Nations Conference on Trade and Development. Organ of the UN. UNCTAD secretariat based on the statistics of the United Nations Food and Agriculture. Market information in the field of commodities "Shea Tree Fruits", N° 2885. Available at: http://unctad.org/infocomm/francais/karite/plan.htm. Accessed February 2001.**

4. El Sheikha, A.F., Métayer, I., Montet, D. (2010). **A Biological bar-code for determining the geographical origin of fruit by using 28S rDNA fingerprinting of fungi communities by PCR-DGGE: an application to Physalis fruits from Egypt". *Food Biotechnology*. (Submitted)**

5. El Sheikha, A.F. & Montet, D. (2010). **Determination of fruit origin by using 28S rDNA fingerprinting of fungal communities by PCR-DGGE: An application to Physalis fruits from Egypt, Uganda and Colombia. *Fruits*. (Submitted)**



2nd International MoniQA Conference
8-10 June 2010, Krakow, Poland
„Emerging and persisting food hazards:
Analytical challenges and socio-economic impact"