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PREVALENCE AND CHARACTERIZATION OF THERMOPHILIC SPOREFORMERS IN FRENCH DAIRY POWDERS

Louis DELAUNAY; Sabrina MACE; Emeline COZIEN ; Florence POSTOLLEC; Ivan LEGUERINEL; Anne-Gabrielle MATHOT

INTRODUCTION & OBJECTIVE

During the manufacture of dairy powders, pasteurization is the only thermal step that destroys vegetative and potentially pathogenic microorganisms. However, bacterial spores present in raw milk persist. These can germinate, grow, form biofilms on stainless steel surfaces (specifically in heat exchangers and evaporators). In addition, the conditions encountered (temperature, a_w) are optimal for germination and growth of thermophilic spores. These spore-forming bacteria may alter the final product during rehydration or storage. It is therefore necessary to evaluate their presence in the dairy powder industries in France.

MATERIEL & METHODS

- ❖ Sample recovery (N=62)
- ❖ Powders of different mammals: cow, goat, sheep, mare
- ❖ Different types of powders (N=8) : Whole milk powder, skim milk, casein, caseinate, whey, permeate, proteins, infant formula
- ❖ Thermophilic spore count
Heat treatment of reconstituted milk at 80°C 10 min and 106°C 30 min
- ❖ Enumeration on Milk Plate Count Agar (MPCA) + Bromocresol Purple (BP) + Potato Starch (PS)
- ❖ Isolate recovery (N=313)
- ❖ Differentiation of isolates by M13 RAPD-PCR
- ❖ 16s rDNA sequencing of representative strain for each cluster
- ❖ Identification of the main species

RESULTS

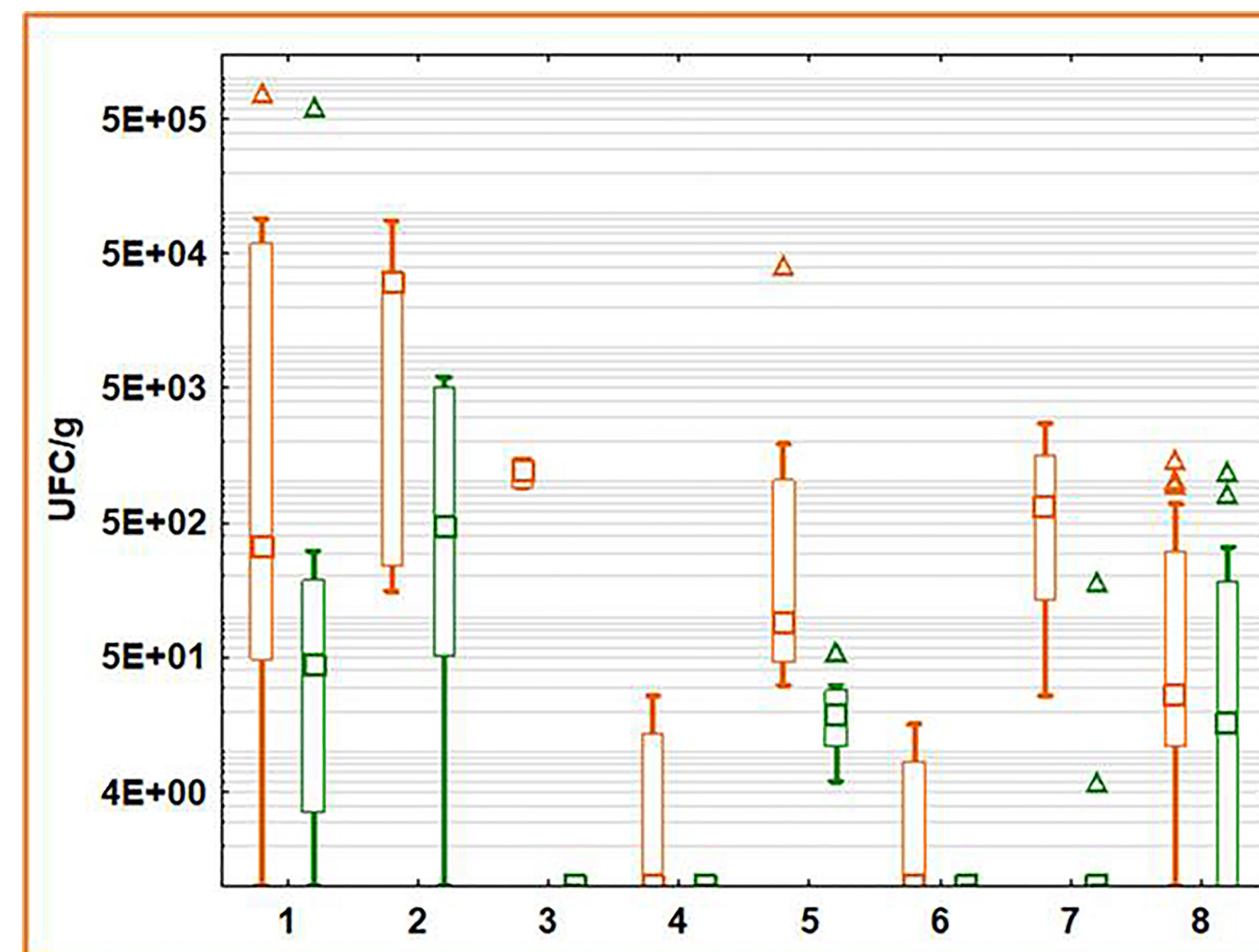


Figure 1: Count of thermophilic spores after heat treatment at 80°C for 10 min (TSC) and 106°C for 30 min (HRTSC). 1: Whole milk powder (N=8); 2: Skim milk powder (N=7); 3: Casein powder (N=2); 4: Caseinate powder (N=4); 5: Whey powder (N=8); 6: Permeate powder (N=4); 7: Protein powder (N=10); 8: Infant Formula (N=19). Central point: median; box: quartile; bar: percentile; Δ : extreme or atypical points

CONCLUSION

- The counts show that the more a product is processed, the lower the amount of thermophilic spores found.
- The M13 RAPD-PCR analysis is sufficiently discriminating to be able to evaluate the diversity of the isolates obtained
- Major species: *Geobacillus stearothermophilus*, *Bacillus licheniformis* and *Anoxybacillus flavithermus*: in accordance with the literature (Postollec et al., 2012; Rückert et al., 2004; Sadiq et al., 2018)
- Specific diversity by powder type: process selection

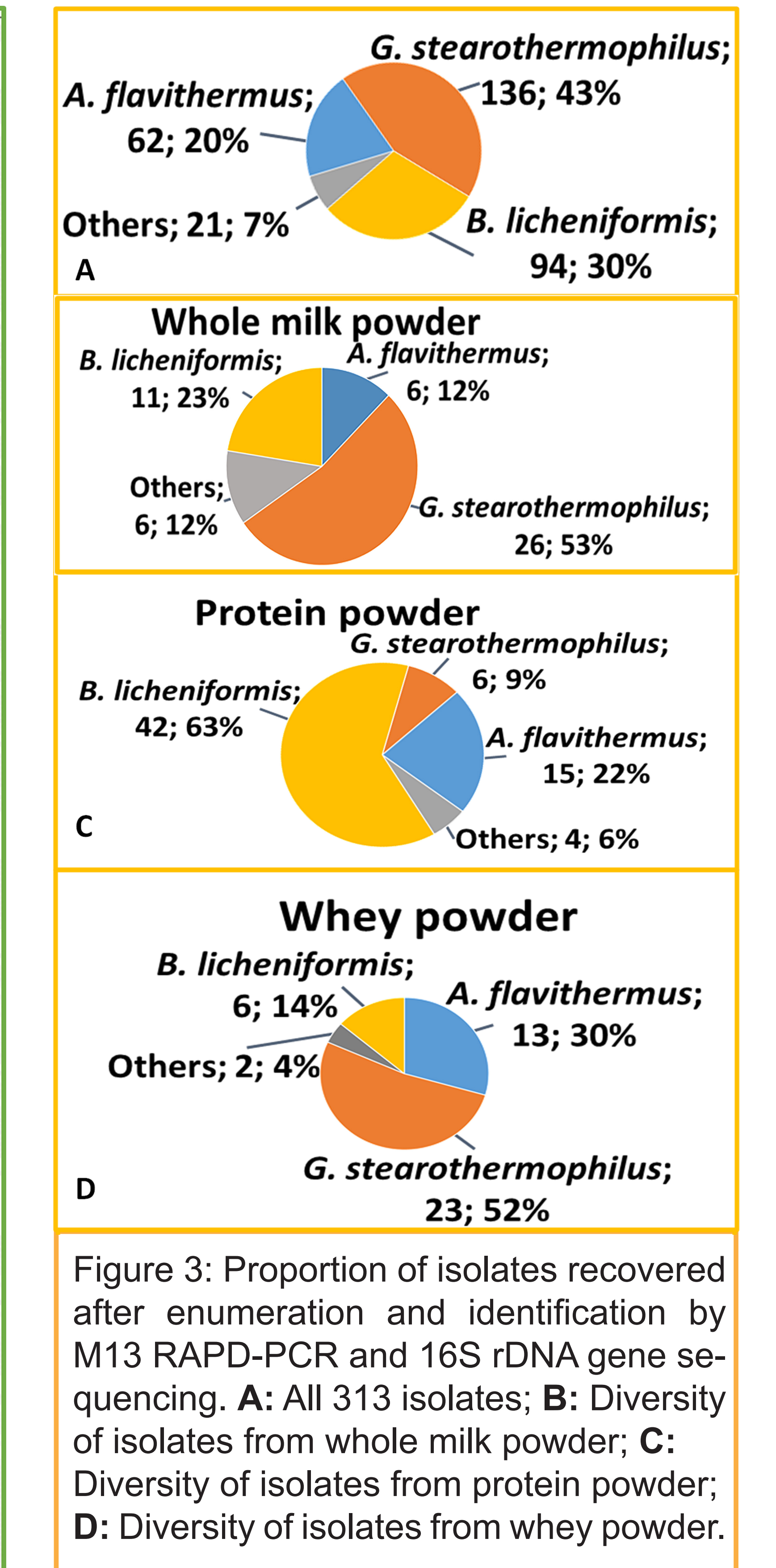
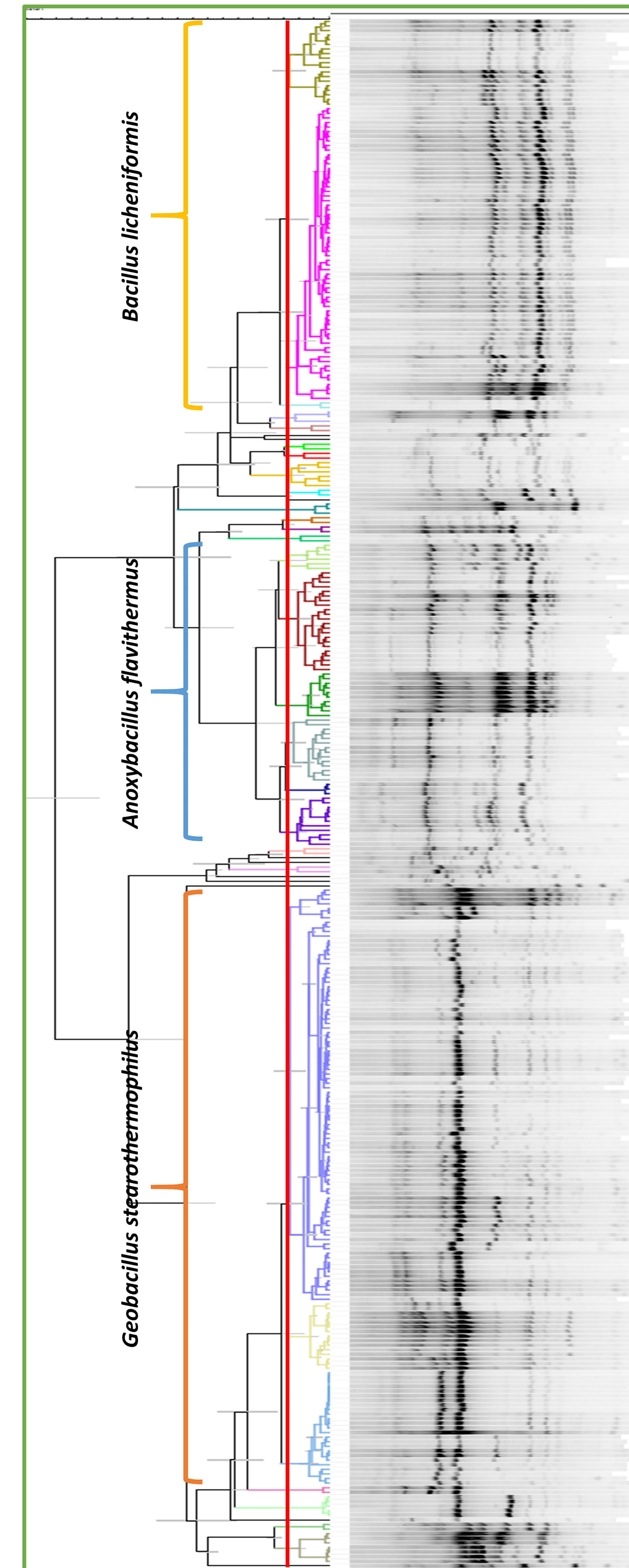


Figure 2: Cluster of M13 RAPD-PCR fingerprints of the 313 isolates obtained after enumeration. — : similarity threshold 87%. { : three main species.