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Developments in health & environment education for sustainable development of Libya

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The paper is designed to present UNCSD Rio+20 Libya Focal Point led shared lessons learned on health & environment education from its global partners in leading universities, research centers, academies, technical and vocational education colleges, institutes, universities, ministries of Science & Technology, development agencies and corporations as well as from its work fostering local development. The objective is to improve excellence, access and impact. After presenting global health & environment related education systems, lessons learned from international partners and investing in R&D, it describes a novel approach in creating an exceptional learning environment that fosters global citizenship, advance a civil and sustainable society and supports outstanding research to serve the people of Libya and the world. Finally results from stakeholder survey that has assisted in developing strategies and plan of action so that Libyan centers of learning and research become a place where innovative ideas are nurtured in a globally connected research community, providing unparalleled opportunities to learn, discover and contribute in one's own way.

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Fast and reliable detection of probiotic lactobacilli and bifidobacteria using qPCR and MALDI-TOF MS

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Probiotics are believed to promote beneficial influences on the gastrointestinal tract and thereby on health in general. Therefore, they are often used in dairy and non-dairy products in human nutrition. Besides usage of probiotics to increase well-being of humans feeding of animals using probiotic bacteria has increased steadily, since European Union approved a prohibition using antibiotics as growth promoters. Classic diagnostic methods used for identification of species of the genera *Lactobacillus* and *Bifidobacterium* are including phenotypic comparison with reference strains and Polymerase Chain Reaction (PCR). In addition, present isolation methods of probiotic bacteria are usage of selective media and different growth conditions resulting in time-consuming, labor-intensive diagnostic schemes by working culture-dependent. Furthermore, phenotypic characterization and species differentiation are error-prone. As probiotic action depends on quality, quantity and viability species detection by conventional PCR-detection method is not feasible, as it does not allows species-specific quantification within DNA sample directly extracted from probiotic source of choice. Thus, there is a need to establish a real time PCR (qPCR) method to comply with the requirements to identify and quantify probiotic strains in food without a prior cultivation step. Screening of different target-sequences for a specific identification of probiotic species ruled out classic targets such as 23s-5s rRNA (intergenic spacer) due to lacking in species-specificity. Other ones as heat shock proteins (hsp60) were chosen for identification and quantification of different members of the genus *Lactobacillus*. The ATPase subunit of the ATP-dependent clpC-gene was selected for the specific identification of members of the genus *Bifidobacterium*. In addition, we established an identification tool by MALDI-TOF MS analysis including the possibility to detect food pathogens if embedded in the database. This procedure allows a rapid inside view assuring species identity of probiotic organisms and an absence of organisms known as food spoiling ones. Within 45 minutes probiotic products are easily screened regarding contain of wanted and unwanted species by MALDI-TOF MS. Established qPCRs had been designed based on the same annealing conditions offering a fast and reliable detection, identification and quantification of different probiotic species in a single qPCR run within 7 hours (including DNA isolation, qPCR preparation and run + analyzing results). Thus, both techniques are easy to handle, less cost- and labor-intensive offering good validation performance for each product to screen. In addition, MALDI-TOF MS allows to be equipped by new protein data or specific primer pairs (qPCR) offering repeatable and standardized results of new species being added assuring product's quality and safety.

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