GM and non GM supply chains: Their CO-EXistence and TRAceability

Outcomes of Co-Extra

"Human versus machine: the pros and cons of real-time PCR setup automation"
Task 5.4: Practical ways to increase accuracy of quantitative PCR methods
Milestone report 5.6
Benefits and limits of real-time PCR setup automation

The costs of analytical procedures in food production chains are significant, therefore, what is needed are more cost-effective, while still reliable, methodologies for GMO detection. One potential solution is the use of a 384 well PCR plate instead of a 96 well format and downsizing total reaction volumes correspondingly. Additional improvement is the use of pipetting robot (automated liquid handling stations). But there are tradeoffs; although this larger through put format may cut down on necessary hands-on work in the lab, certain method performance problems may arise. For this reason, validation and verification of potential new method setups must be performed in order to prove reproducibility of the results and the robustness of the method.

A comparison between a manual and an automated PCR setup was carried out by researchers from Eurofins GeneScan and from the Slovene National Institute of Biology, evaluating 2 different automated liquid handling stations (the Hamilton Microlab Star Liquid Handling Station and the MultiPROBE II Automated Liquid Handling System) and comparing them with results obtained by a hand-operated setup.

All pipetting setups performed well under testing conditions. Manual pipetting was comparable with that of the automated liquid handling stations (as shown in Figures 1 through 3). It was concluded that both devices can be applied to the 96 or 384-well reaction plate formats and that down scaling the total reaction volume from 20 µl to 10 µl is possible without reducing performance parameters such as repeatability, LOD, LOQ or trueness.

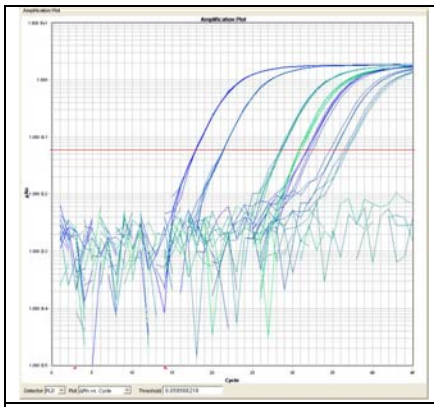


Figure 1: Example of results for manual pipetting.

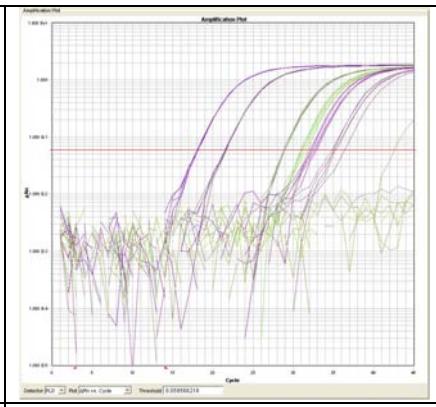


Figure 2: Example of results for automated pipetting.

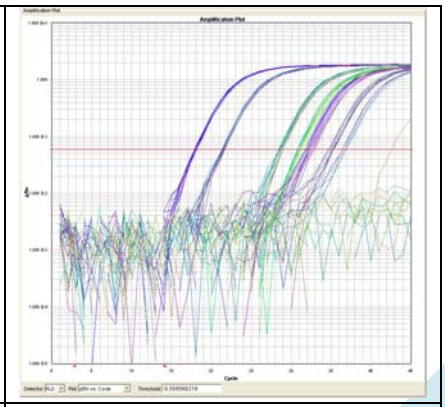
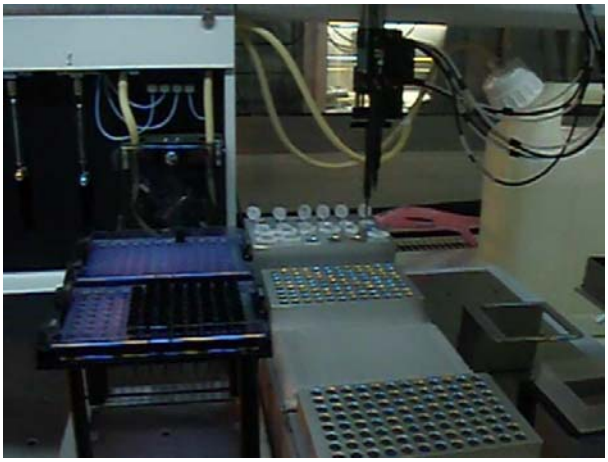


Figure 3: Combined results for manual and automated pipetting.

Economic aspects and implications should always be considered before switching from a manual to an automated setup. A significant cost factor, of course, is the initial investment in the liquid handling apparatus. Depending on the dimensions and equipment of the machine, this expense can be between 10 000 and 100 000 Euros. Further costs accompany extra hardware needed to perform real-time PCR in the 384 well format, running costs and considerable expenses associated with maintenance and repair. However, the long term cost benefits of the automated PCR setup include the capability of processing one or more PCR plates in parallel without any user intervention saving hours of hands-on time and money for some consumables such as pipette tips. By switching from the 96 to the 384 well plate format it is also possible to increase the number of test results per real-time PCR run while reducing the total reaction volume and thus saving money on master mixes. Overall, the implementation of an automated pipetting device into routine analysis is recommended for labs with high sample throughput.



Automated liquid handling station