

The performance of Micro-Tester as a redox potential measurement for microbial detection and quantification

Eya Yakdhane ^{1,b}, Dóra Tózsér²; Katalin Szakmár²; László Baranyai³; Gabriella Kiskó¹

¹Hungarian University of Agriculture and Life Sciences (MATE), Faculty of Food Science, Department of Food Microbiology and Biotechnology, Budapest, Hungary

²Department of Food Hygiene, University of Veterinary Medicine, H-1078 Budapest, István u. 2. Hungary

³Hungarian University of Agriculture and Life Sciences (MATE), Faculty of Food Science, Department of Physics-Control, H-1118 Budapest, Somlói út 17, Hungary

Introduction

Several techniques were developed to detect microorganisms more efficiently in a limited time. Impedimetric, PCR, and redox potential methods are among the new generation methods that alternate the plate colony technique since the conventional technique is time-consuming, tiring, and in some cases, cannot detect microorganisms if they are not present in high numbers.

Table 1. Comparison between the standard plate colony counting, impedimetric, Real time-PCR, redox potential methods (Reichart et al., 2007; Young-HunKim et al., 2009; Botes, M. et al., 2012; Erdosi et al., 2012; Jasson et al., 2010)

Method	Standard counting colonies method	Impedimetric method	PCR method	Redox-potential measurements
Time consuming	24h -72h	Few hours	Few hours	4h-16h
Dilutions	+	-	-	-
Reproducibility	+	+	+	+
Repeatability	+	+	+	+
Selectivity	+	+	+	+
Specific fluids	Does not require specific fluids	Require specific fluid	Require specific fluid	Does not require specific fluids
Instruments	Needs a lot of tools	Can be reduced	Needs a lot of tools	Can be reduced

Redox potential technique is non laborious, rapid, and an accurate method. It also shows a good selectivity, repeatability, and reproducibility.

- : "Bad" in case of selectivity, repeatability, or reproducibility and "Do not need series of dilution" in case of dilution line

+ : "Good" in case of selectivity, repeatability, and reproducibility or "Need series of dilution" in case of dilution line

Redox potential curves

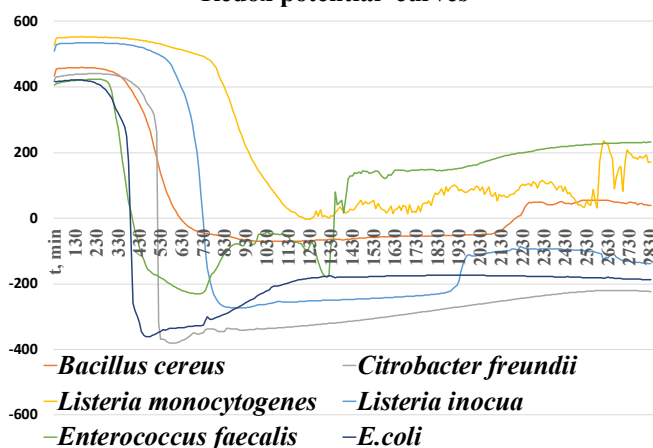


Table 2. Summary table of the statistical analysis for the six bacteria

Groups	Count	Sum	Average	Variance
<i>Bacillus cereus</i>	285	16949.39	59.47154	32003.31
<i>Citrobacter freundii</i>	285	-44945.7	-157.704	77981.5
<i>Listeria monocytogenes</i>	285	62437.12	219.0776	44751.64
<i>Listeria innocua</i>	285	-3341.28	-11.7238	92665.89
<i>Enterococcus faecalis</i>	285	29592.58	103.8336	34255.68
<i>E coli</i>	285	-36489	-128.031	46916.88

Table 3. One-way ANOVA table

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	29215734	5	5843147	106.6998	3.59E-98	2.219349
Within Groups	93315272	1704	54762.48			
Total	1.23E+08	1709				

The six bacteria have different redox potential curve shape, and they could have been discriminated since in ANOVA table we found that P-value is highly less than 0.05.

Figure: Redox potential curves of *Bacillus cereus*, *Citrobacter freundii*, *Listeria monocytogenes*, *Listeria innocua*, *Enterococcus faecalis*, and *E coli*

Conclusion

In this study we could determine that redox potential method is a great alternative since it is accurate and does not demand so much effort or time to get the results. From the statistical analysis, we could detect that each studied bacteria has a unique and remarkable shape of redox potential curve.

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