

Visualising SYBR dyes using a Syngene image capture system

Introduction

SYBR Dyes were introduced in 1993 and have become very popular nucleic acid gel stains due to their high sensitivity and ease of use. Commonly used SYBR dyes are SYBR Green, SYBR Gold and SYBR Safe.

All the SYBR Dyes from Invitrogen, UK are increasingly used as an alternative to Ethidium Bromide in the visualization of nucleic acids. SYBR dyes bind directly to the nucleic acid and upon excitation with an appropriate light source, a green light is emitted that can be imaged and quantified. There are two main reasons for the popularity of SYBR dyes the first is that it is less mutagenic than ethidium bromide and the second reason is that SYBR dyes offer enhanced sensitivity.

There are two types of SYBR Green; SYBR Green I which preferentially stains dsDNA. SYBR Green II shows enhanced sensitivity for RNA whilst also staining ds and ssDNA.

SYBR Gold is a proprietary unsymmetrical cyanine dye that exhibits >1000-fold fluorescence enhancement upon binding to nucleic acids. SYBR Gold stain penetrates thick and high percentage agarose gels rapidly.

SYBR safe stains DNA and RNA in agarose or acrylamide gels and is a safer alternative to ethidium bromide.

Applications

The high sensitivity of SYBR dyes makes them very useful in applications requiring the detection of low target number DNA amplification products, the detection and restriction analysis of low-copy number DNA and RNA vectors, and the detection of products of nuclease protection and bandshift assays. SYBR Green II and SYBR Gold have been shown to be particularly useful in single-stranded conformation polymorphism (SSCP) studies.

Visualization

Applications using the SYBR dyes can be easily visualized using all Syngene image capture systems. The SYBR Green I stain has an excitation peak of 290nm and an emission peak of 520nm (**Figure 1a**). The SYBR Green II stain has an excitation and emission peak of 254nm and 520nm respectively (currently no spectra available).

The SYBR Gold dye has an excitation peak of 300nm and an emission peak of 537nm (**Figure 1b**). SYBR Safe dye has an excitation peak of 280nm and 480nm and an emission peak of 530nm (**Figure 1c**).

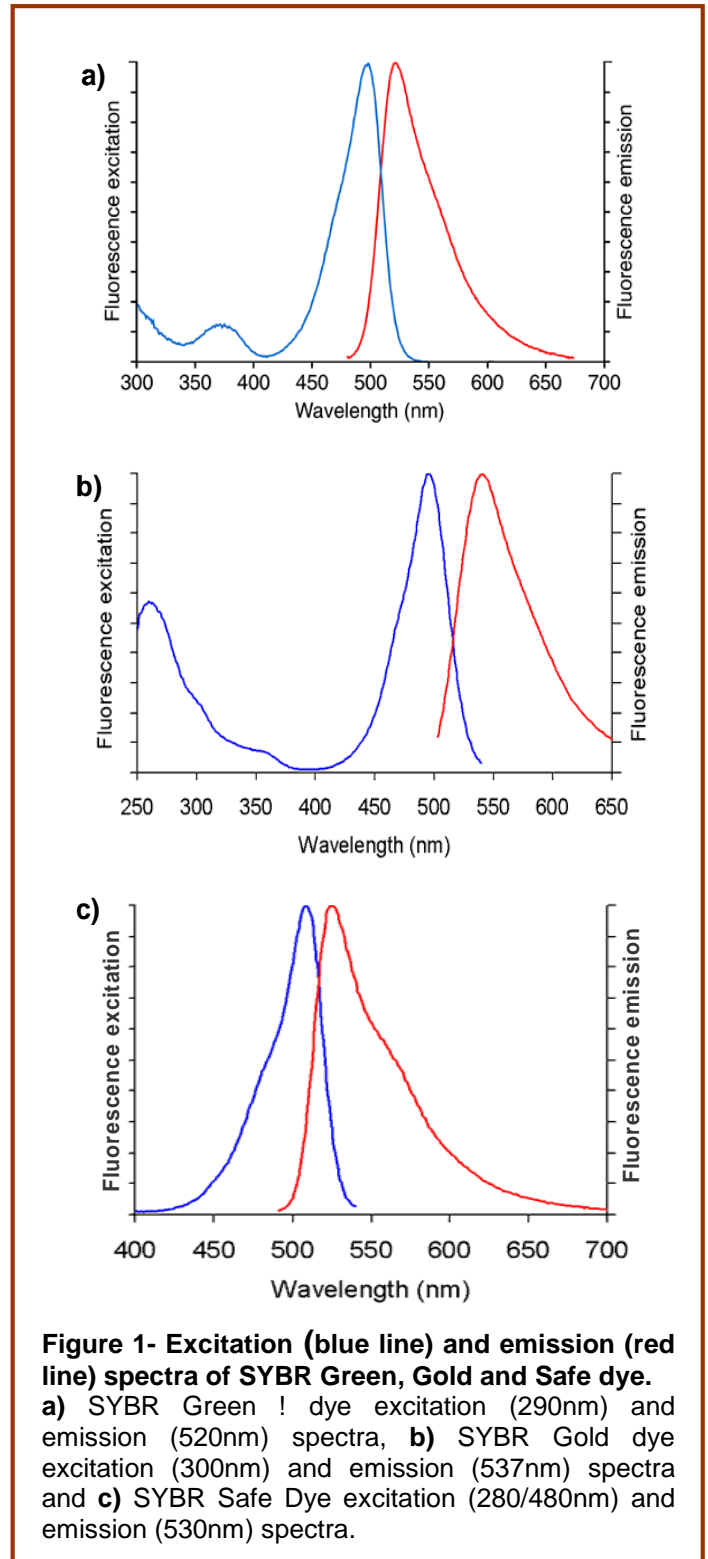
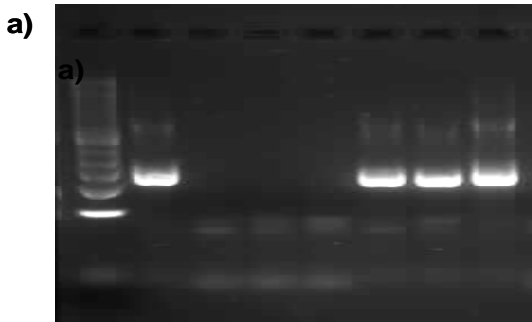
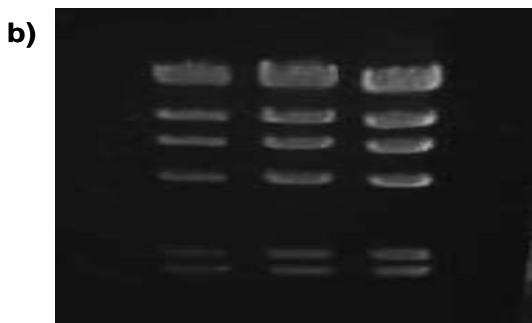


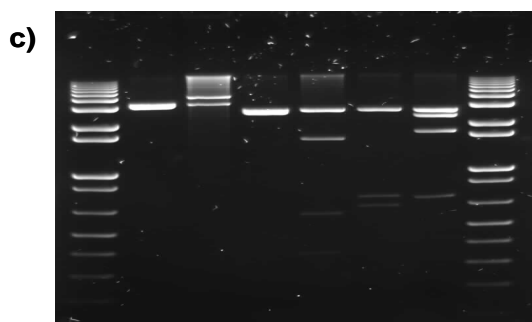
Figure 1- Excitation (blue line) and emission (red line) spectra of SYBR Green, Gold and Safe dye. a) SYBR Green I dye excitation (290nm) and emission (520nm) spectra, b) SYBR Gold dye excitation (300nm) and emission (537nm) spectra and c) SYBR Safe Dye excitation (280/480nm) and emission (530nm) spectra.



SYSTEM	LIGHTING	FILTER
Dyversity, G:Box iChemi ranges and InGenius	Transilluminator MW UV	FiltSP
	Epi LW UV	FiltSP
	Blue light converter on transilluminator	FiltSG
	Safe Imager	FiltSI



SYSTEM	LIGHTING	FILTER
Dyversity, G:Box iChemi ranges and InGenius	Transilluminator MW UV	FiltSP
	Epi LW UV	FiltSP
	Blue light converter on transilluminator	FiltSG
	Safe Imager	FiltSI



SYSTEM	LIGHTING	FILTER
Dyversity, G:Box iChemi ranges and InGenius	Transilluminator MW UV	FiltSP
	Epi LW UV	FiltSP
	Blue light converter on transilluminator	FiltSG
	Safe Imager	FiltSI
	Epi blue from RGB module	FiltUV

Figure 2- Gel images of SYBR dyes and recommended lighting and filter selection tables

a) PCR product stained with SYBR Green I, bands were visualized using a transilluminator MW UV and a SP filter with an exposure time of 40ms. **b)** PCR product stained with SYBR Gold, bands were visualised by exposure to Epi LW UV lighting with a UV filter with an exposure time of 430ms. **c)** DNA samples were pre-stained with SYBR Safe, bands were visualized by exposure to UV light on a transilluminator and a SP filter with an exposure time of 300ms.

All Images were captured using a G:BOX iChemi XR (Syngene, UK).

Summary

Syngene image capture systems combined with GeneSnap software are the perfect combination for imaging SYBR dyes. Syngene’s imaging software GeneSnap produces the ideal gel image with bright, sharp and clearly distinguished bands as shown in **Figure 2** when the appropriate lighting and filter combination are selected.

Syngene reserves the right to amend or change specifications without prior notice. This Application Note supersedes all earlier versions.

All trademarks acknowledged.

May 2010

UK tel: +44 (0)1223 727123
Email: sales@syngene.com

USA tel: 800 686 4407/301 662 2863
Email: ussales@syngene.com