



GeneTools the Essential Software For Accurate DNA/RNA Gel and Blot Analysis

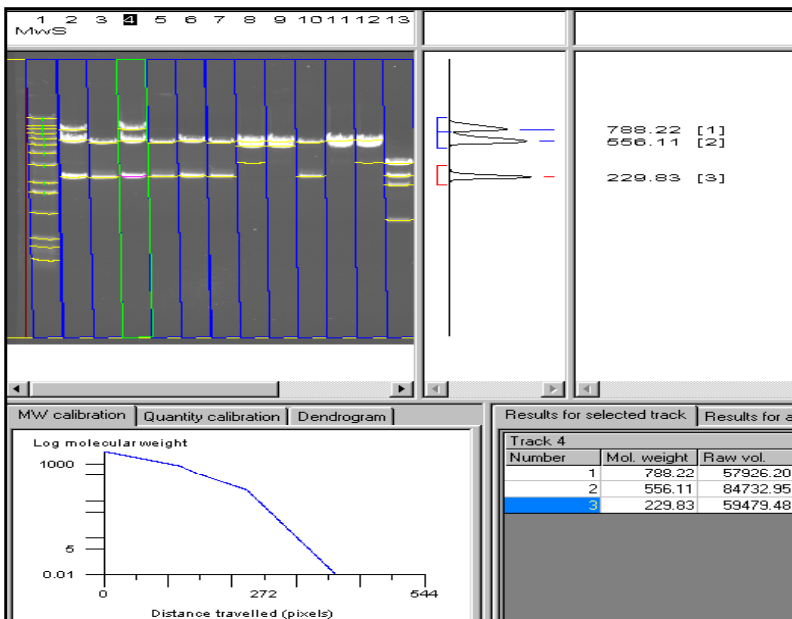
Introduction

Capturing an image of a DNA/RNA gel or blot with an image analysis system is only the start of determining what information that image has to yield. To help guide users, Syngene presents in this application note a selection of DNA/RNA gel and blot applications of GeneTools, the software included with the Genius range of Syngene's powerful image analysis systems. The array of GeneTools applications has been developed by Syngene from many years' experience of producing integrated imaging equipment as well as consultation and feedback given by many international scientists using Syngene systems.

Analysing Differently Stained Gels

GeneTools can be used to quantify DNA on one-dimensional gels stained with a range of fluorescent dyes. The results of any DNA gel analysis by GeneTools are simultaneously displayed in one window as a gel image alongside a histogram and tabulated data (Figure 1).

Figure 1: GeneTools analysis showing an agarose gel of DNA samples and its associated molecular weight data.



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The software easily handles images of agarose gels stained with the most commonly used fluorescent stains such as ethidium bromide or SYBR-Green (Figures 2 and 3).

Figure 2: Ethidium bromide stained gel showing PCR products (lanes 2-11) and DNA markers (lanes 1 and 12).

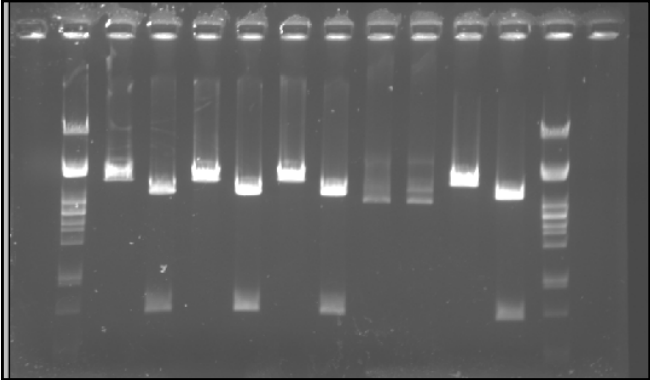
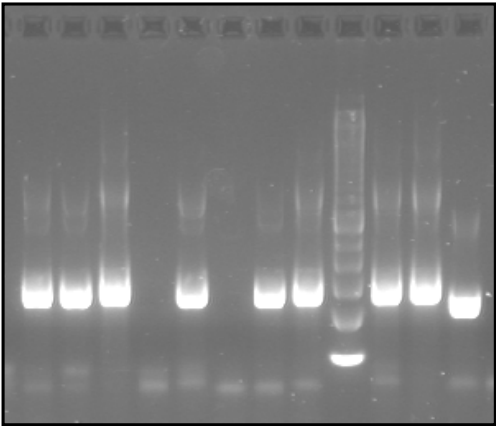
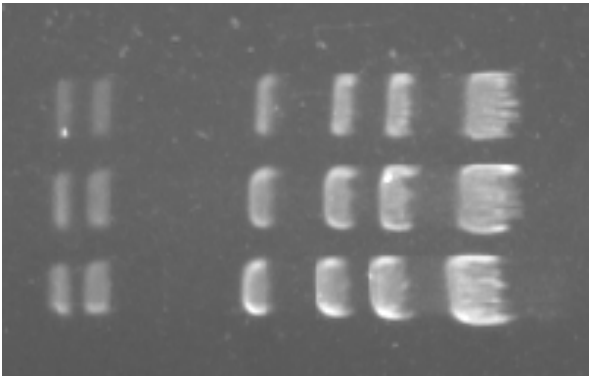


Figure 3: SYBR-Green stained gel.



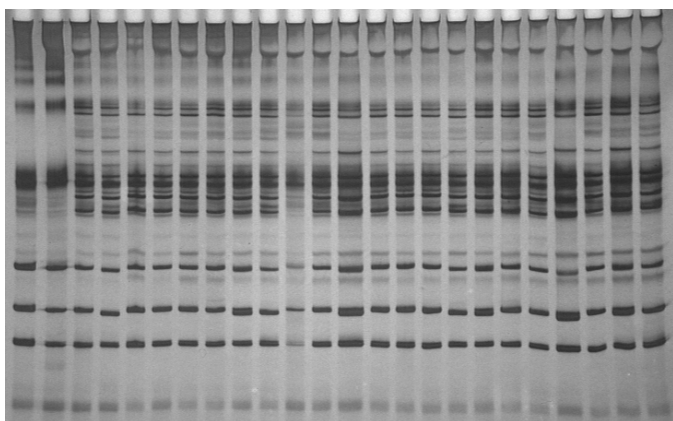
However, it can also be used to analyse images of agarose gels stained with other fluorescent stains. For example, GeneTools can analyse images of SYBR-Gold or fluorescein stained agarose gels (Figure 4), which have been captured using the ChemiGenius² or GeneGenius's Blue Light Converter or Dark Reader options.

Figure 4: SYBR Gold stained gel showing DNA markers (lanes 1 -3).



Other types of staining techniques can also be used in conjunction with GeneTools. Silver stained acrylamide gels used to separate very small SSCP DNA samples have bands that are very close together (Figure 5). However, GeneTools will ensure each band is recognised separately and will be automatically analysed as a single band.

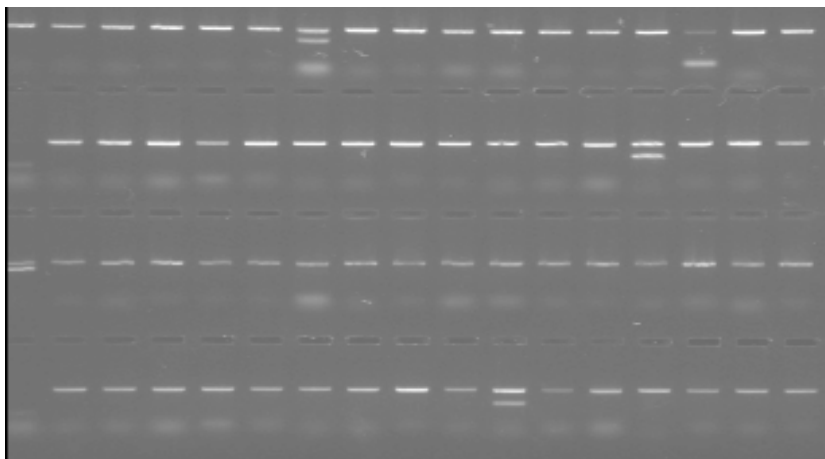
Figure 5: Silver stained acrylamide gel showing SSCP DNA bands (lanes 1-24).



Multiple Gel Analysis

GeneTools includes an automated multi-layer gel analysis capability, which automatically analyses each row as if it were an individual gel. This means users can obtain separate results from several different gel layers using one large gel and a single electrophoresis run (Figure 6).

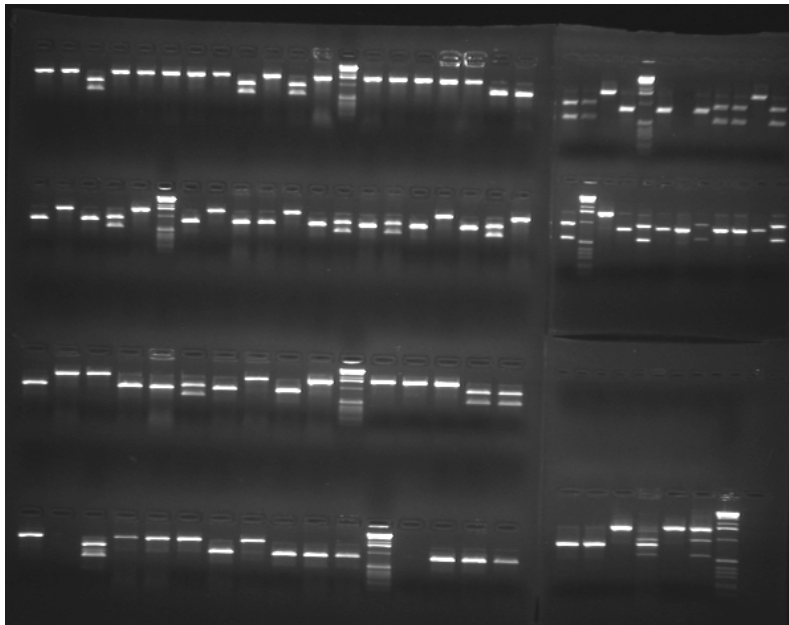
Figure 6: Agarose gel stained with ethidium bromide showing four layers (from top to bottom) of DNA samples (lanes 1-17).



Using the zoom capabilities of the ChemiGenius² or GeneGenius image analysers' cameras, an image of up to 20 cm x 20 cm (20 cm x 30 cm with the optional larger transilluminator) can easily be captured (Figure 7). This saves time by allowing users to place several small gels together on one transilluminator and then perform one image capture followed by several separate but simultaneous analyses using GeneTools.

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Figure 7: Agarose gels stained with ethidium bromide. On the left is one four layer gel and on the right are two separate single layer gels stacked one above the other.



Chemiluminescent Applications

Slot and Dot Blots

GeneTools can be used to quantify the amount of DNA on both chemiluminescent slot and dot blots in gridded or non-gridded formats.

Gels and Gel-based Blots

The software can also analyse chemiluminescent samples directly from gels or when they have been transferred onto nitrocellulose or nylon membranes. For example, the software works well with DNA on Southern blots as well as RNA on Northern blots.

Band and Spot Matching/Scoring Applications

For comparing samples, GeneTools has a variety of rapid automated band matching methods. Users simply select a band pattern they are interested in and using Syngene's one button click technology, any matches on the image are instantly displayed. For example, GeneTools can determine if two or more bands in a selected track match any other band on that gel according to their position, molecular weight or Rf value, thus saving a great deal of time.

GeneTools is so sophisticated that the analysis can also be extended to dot blots where the software can be set to find positive or negative results within user defined parameters.

The results of any match or score are displayed instantly in one window. The gel image appears alongside a histogram showing the track of interest overlaid in a different colour with the track selected as the matching reference track. The single analysis window of GeneTools also displays a dendrogram and comparison data with scoring being given in the form of ones and zeros.

Conclusions

The flexibility, GLP compliance and the availability of upgrades are all factors potential users should consider when choosing image analysis software. GeneTools scores very highly in all of these areas. Since the software can produce a full analysis in less than eight seconds, it can be used for any applications where speed and accuracy are essential such as determining molecular weights or quantities of DNA in a sample. Results from any analysis can be immediately transferred to Excel spreadsheets or saved as text files for archiving and use in reports.

GeneTools produces a comprehensive, GLP compliant report detailing all analysis performed on an image. The exact specifications and content of this report can be adjusted by the user. The entire report can be transferred to Word with a single mouseclick. Consequently components of the report such as track histograms and results tables can easily be transferred into presentations and data summaries.

For users wanting to perform further matching, genotyping, VNTR or RFLP analysis, Syngene offers GeneDirectory. This software is fully compatible with GeneTools and can be used to create vast libraries of data for comparison and analysis.

GeneTools is so versatile that not only is it utilised for a range of DNA/RNA gel and blot applications but can also be used for colony and cell counting as well as protein gel and blot applications. It is fully GLP compliant, with each analysed set of results being assigned a unique identity number so that a re-analysed sample can be detected. In addition, Syngene provides all GeneTools software upgrades for life, free of charge to ensure that GeneTools users will always have access to the most current application features. These benefits combined with Syngene's expert advice and assistance, makes using GeneTools an extremely attractive option for many busy molecular biology laboratories.