The Master Thesis focuses on monitoring of intracellular ion concentrations in bacteria Escherichia coli and yeast Saccharomyces cerevisiae using genetically encoded fluorescent probes with green fluorescent protein (GFP). Aquired knowledge about this protein and its spectral characteristics is summarized in the introduction. For experimental study a pH-sensitive sensor which displays a ratio change of two excitation fluorescence peaks – pHluorin – was chosen. This probe was tested in bacteria and yeast cells. The experiments concentrated on the ability of the cell to maintain a constant cytosolic pH under various conditions like different pH values of the suspension, addition of glucose or KCl to the suspension. Another topic discussed in the thesis is the elimination of the cell autofluorescence from the GFP signal. For this purpose the synchronous fluorescence scan technique was succesfully used. I have found out that by using this method the measurements of cytosolic pH values are even more accurate thanks to the improved signal to noise ratio.