Lipids play essential role in cell metabolism as membrane building blocks, energy source and signalling molecules. Based on their chemical composition lipids can be divided into four major groups: 1) galactolipids, 2) phospholipids, 3) triacylglycerols and 4) sphingolipids. Meanwhile the protective and signalling role of sphingolipids is relatively well known in animal, their function in plant cells is not clear, mainly due to a very limited number of studies. Interestingly, increasing evidence suggest that plant sphingolipids may be essential for plant protection against pathogens (like bacteria or fungi). This project is focused on deciphering the mechanisms governing sphingolipid metabolism in plant cells and on addressing their role in plant defense responses, including programmed cell death (PCD) triggered upon the attack of pathogenic bacteria or fungi. Our studies will be conducted on *Brachypodium distachyon*, which is a convenient model for monocot plants (like grasses or cereals) and on *Arabidopsis thaliana* - a common dicot experimental model from Brassicaceae family (eg. rape or cabbage). The obtained results will expand our knowledge on plant sphingolipids and this knowledge will be of direct use for designing new crop protection strategies against pathogenic microorganisms.