Nitrogen is one of the basic nutrients required for sustainable development of all living organisms. Plants can make use of two inorganic nitrogen forms, nitrate ($NO_3^-$) or ammonium ($NH_4^+$) ions available in the soil. Changes in the state of reduction between the nitrogen sources, provokes that the assimilation of ammonium is energetically more efficient for plants. It may be expected that the savings in energy expenditure in tissues of ammonium grown plants may be used for other metabolic reactions leading to improved plant condition. Nevertheless, the application of ammonium as the sole nitrogen source for most crop plants leads to adverse health effects, which was defined as the ammonium syndrome, these range from acute poisoning to growth suppression. Therefore, when facing agricultural economics the observed symptoms of plants exposure to ammonium are highly undesirable. For several decades research trying to decode the ammonium syndrome has been undertaken, but the mystery of plant physiology remains unsolved. Most probably the ultimate cause behind the toxicity of ammonium to plants is a multifactoral process. Research by our team tackling this issue, has proved that long-term ammonium nutrition triggers: changes in oxidation-reduction state in different cell compartments leading to elevated reactive oxygen species (ROS) production, maintains deficiencies of essential cations necessary for plant development, induces damage of cellular biomolecules. However, many of the observed attendant changes in plant metabolism may be secondary effects, induced by acclimation of plants to different environment conditions, and not the profound response of the plant cell to ammonium. In this project primary effect induced by ammonium ions will be analysed. Since the extracellular space (apoplast) and plasmalemma are the primary compartments receiving any environmental stress signal, this project focuses on signs in these compartments.