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Natural polyamines and synthetic analogues modify the growth and the morphology of *Pyrus communis* pollen tubes affecting ROS levels and causing cell death

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Highlights

- Polyamines (PAs) are widespread small polycations essential for cell growth and development
- The present work shows that exogenous PAs alter pollen morphology and vitality
- PAs modulate ROS-producing/scavenging enzymes during the apical growth of pear pollen tube
- The presence a primary amine, the steric hindrance of aryl moiety and electron-donating groups on it are critical features for PAs' activity
- These results may contribute to understand the intricate networks involved in pollen tube germination

Abstract

Polyamines (PAs) are small molecules necessary for pollen maturation and tube growth. Their role is often controversial, since they may act as pro-survival factors as well as factors promoting Programmed Cell Death (PCD). The aim of the present work was to evaluate the effect of exogenous PAs on the apical growth of pear (*Pyrus communis*) pollen tube and to understand if PAs and reactive oxygen species (ROS) are interconnected in the process of tip-growth. In the present study besides natural PAs, also aryl-substituted spermine (Spm) and methoctramine (Met 6-8-6) analogues were tested. Among the natural PAs, Spm showed strongest effects on tube growth. Spm entered through the pollen tube tip, then diffused in the sub-apical region that underwent drastic morphological changes, showing enlarged tip. Analogues were mostly less efficient than natural PAs but BD23, an asymmetric synthetic PAs bearing a pyridine ring, showed similar effects. These effects were related to PA ability to cause the decrease of ROS level in the apical zone, leading to cell death, counteracted

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