The phytohormone ethylene plays an important role in promoting the softening of climacteric fruits, such as apples (*Malus domestica*); however, important aspects of the underlying regulatory mechanisms are not well understood. In this study, we identified apple MITOGEN-ACTIVATED PROTEIN KINASE 3 (MdMAPK3) as an important positive regulator of ethylene-induced apple fruit softening during storage. Specifically, we show that MdMAPK3 interacts with and phosphorylates the transcription factor NAM-ATAF1/2-CUC2 72 (MdNAC72), which functions as a transcriptional repressor of the cell wall degradation-related gene *POLYGALACTURONASE1* (*MdPG1*). The increase in MdMAPK3 kinase activity was induced by ethylene, which promoted the phosphorylation of MdNAC72 by MdMAPK3. Additionally, MdPUB24 functions as an E3 ubiquitin ligase to ubiquitinate MdNAC72, resulting in its degradation via the 26S proteasome pathway, which was enhanced by ethylene-induced phosphorylation of MdNAC72 by MdMAPK3. The degradation of MdNAC72 increased the expression of *MdPG1*, which in turn promoted apple fruit softening. Notably, using variants of MdNAC72 that were mutated at specific phosphorylation sites, we observed that the phosphorylation state of MdNAC72 affected apple fruit softening during storage. This study thus reveals that the ethylene-MdMAPK3-MdNAC72-MdPUB24 module is involved in ethylene-induced apple fruit softening, providing insights into climacteric fruit softening.