Plant circumnutation and its dependence on the gravity response

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Plant organs display helical growth movement known as circumnutation. These movements help plant organs find suitable environmental cues. The amplitude, period and shape of the circumnutation differ depending on plant species or organs. Although the mechanism for circumnutation is unclear, it has long been argued whether circumnutation is involved with gravitropic response. Previously, we showed that shoots of weeping morning glory (*we1* and *we2*) are impaired in not only the differentiation of endodermis (gravisensing cells) and gravitropic response, but also winding and circumnutation. In addition, we found a reduced circumnutation in the shoots of Arabidopsis and rice mutants defective in gravitropic response. These results suggest that circumnutation is tightly related with gravitropic response. Also, the results suggest that winding behavior of climbing plants such as morning glory could be driven by the circumnutation. In the proposed spaceflight experiments, we will verify the hypothesis that circumnutation requires gravity response, by using microgravity environment in KIBO module of the International Space Station. We will grow rice and morning glory plants under both μG and 1G conditions on orbit and monitor their growth by a camera. Images downlinked will be analyzed for the measurements of plant growth and nutational movements. This experiment will enable us to answer the question whether circumnutation depends on gravity response or not. The results to be obtained in this study will establish a model for clarifying molecular aspects of circumnutation and bring about a development of new technologies to efficiently grow plants under altered gravity conditions in space.