## Abstract

We developed a strawberry-harvesting robot, consisting of a cylindrical manipulator, end-effector, machine vision unit, storage unit and travelling unit, for application to an elevated substrate culture. The robot was based on the development concepts of night operation, peduncle handling and task sharing with workers, to overcome the robotic harvesting problems identified by previous studies, such as low work efficiency, low success rate, fruit damage, difficulty of detection in unstable illumination and high cost. In functional tests, the machine vision assessments of fruit maturity agreed with human assessments for the Amaotome and Beni-hoppe cultivars, but the performance for Amaotome was significantly better. Moreover, the machine vision unit correctly detected a peduncle of the target fruit at a rate of 60%. In harvesting tests conducted throughout the harvest season on target fruits with a maturity of 80% or more, the successful harvesting rate of the system was 41.3% when fruits were picked using a suction device before cutting the peduncle, while the rate was 34.9% when fruits were picked without suction. There were no significant differences between the two picking methods in terms of unsuccessful picking rates. The execution time for the successful harvest of a single fruit, including the time taken to transfer the harvested fruit to a tray, was 11.5 s.