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OsKCH2 is a novel processive minus end-directed kinesin-14 motor ALLISON GICKING, KUO-FU TSENG, PAN WANG, Oregon State University, YUH-RU JULIE LEE, UC Davis, JOEL BOWEN, Oregon State University, LIJUN GUO, Henan University, WEIHONG QIU, Oregon State University, BO LIU, UC Davis — In animals and fungi, cytoplasmic dynein contains the ability to generate processive minus end-directed motility on single microtubules without having to form multi-motor ensembles and thus plays a dominant role over kinesin-14 motors. However, land plants do not have cytoplasmic dynein, and no plant kinesin-14 motor is known to be able to move processively on single microtubules as a homodimer. Here, we have analyzed the motility of OsKCH2 – a plant-specific kinesin-14 that contains an N-terminal actin-binding CH domain and a central microtubule-binding motor domain flanked by a pair of putative coiled coils (CC1 and CC2) – using TIRF microscopy. We found that OsKCH2 transports actin filaments along the microtubules and exhibits processive minus end-directed motility as a homodimer. We have further revealed that only the upstream CC1 forms a coiled coil to enable the formation of OsKCH2 homodimers. In contrast, the downstream CC2 does not form an authentic coiled-coil and instead plays an indispensable role in OsKCH2 processivity by enhancing its binding to the microtubule. Collectively, this study shows that land plants have evolved unconventional kinesin-14 homodimers with inherent minus end-directed processivity that likely compensate for the loss of cytoplasmic dynein.

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