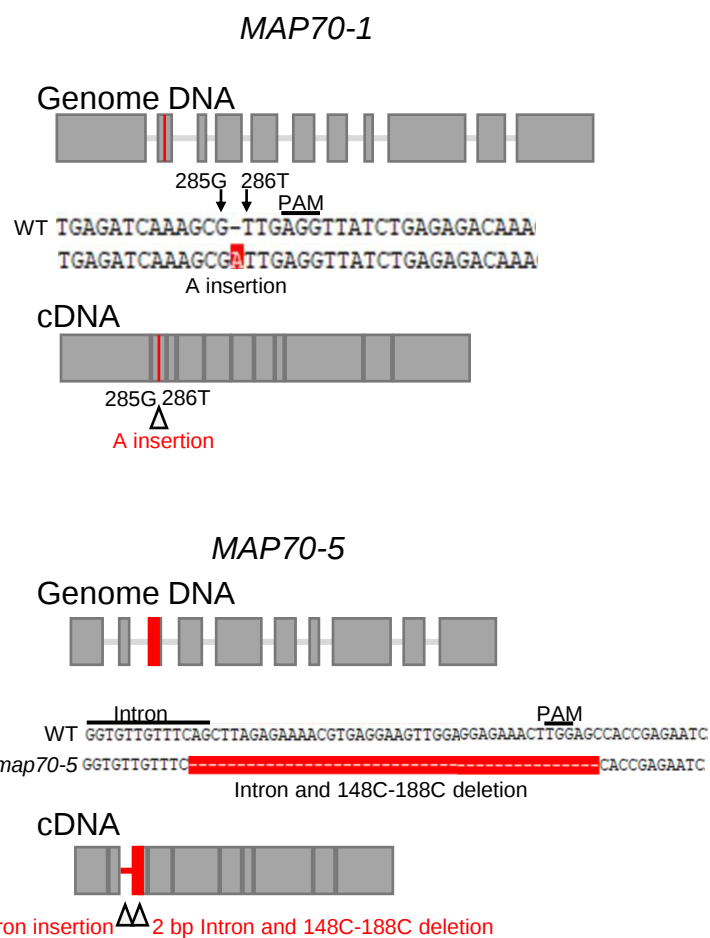




**Supplemental Figure 1. Mutation sites in genomic DNA and cDNA of *map70-1* and *map70-5***

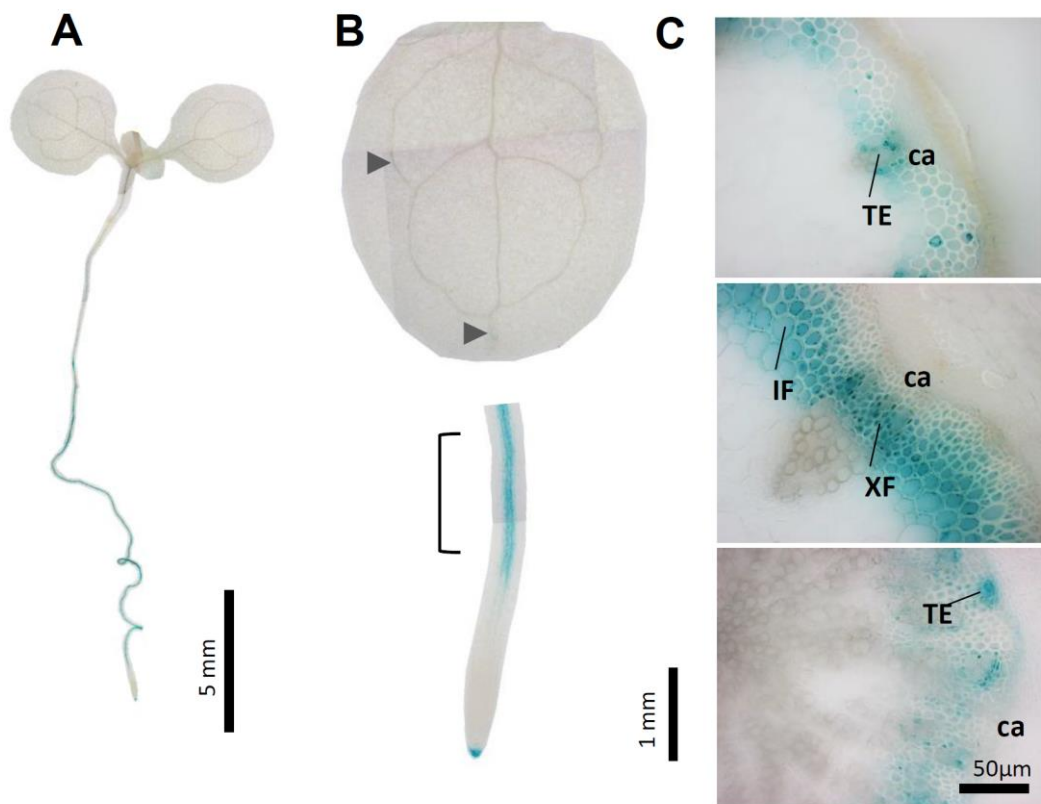


**Supplemental Figure 2. *map70-1 map70-5* plants grow normally**

(A) 10-days-old seedlings of wild type (WT) and *map70-1 map70-5* plants.

(B) Length of primary roots of wild type (WT) and *map70-1 map70-5* plants.

N = 31 (WT) and 33 (*map70-1 map70-5*) plants.



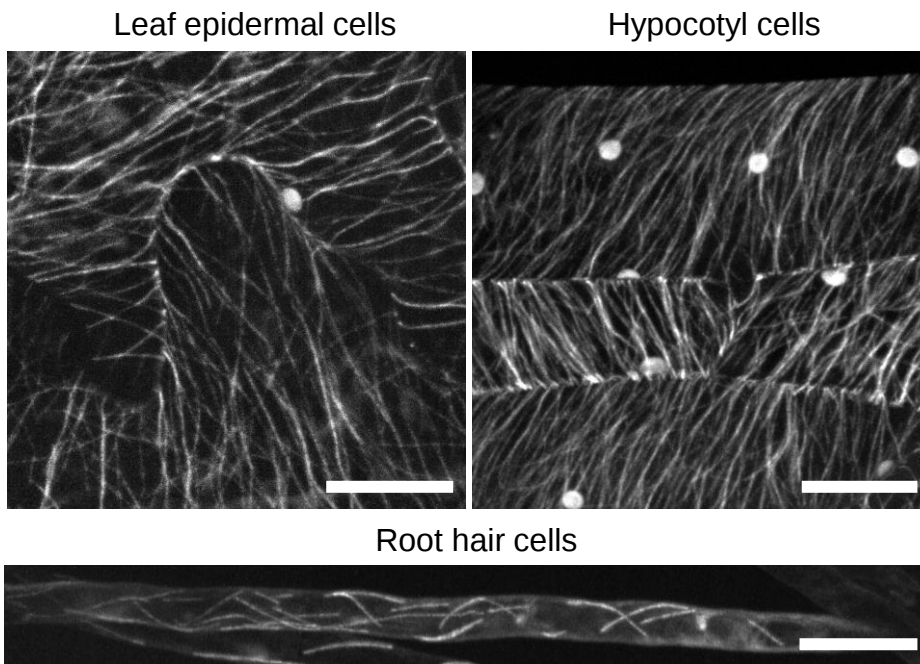
**Supplemental Figure 3. *MAP70-5* promoter is specific to xylem tissues**

(A) 7-day-old whole seedling of *pMAP70-5:GUS* showing  $\beta$ -glucuronidase activity in living tracheary elements (TEs).

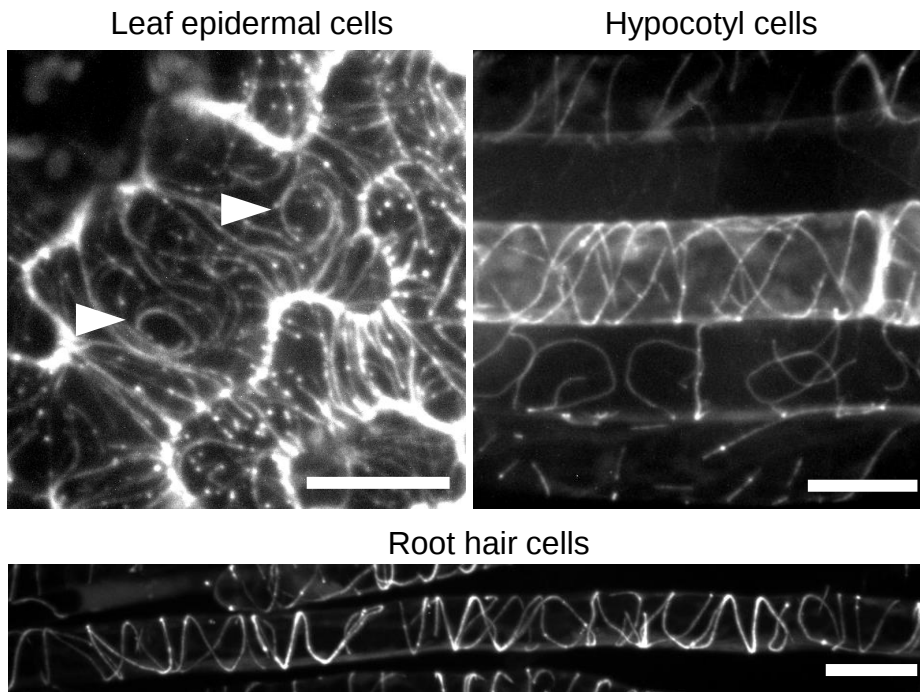
(B) Close-ups of cotyledon and root highlighting  $\beta$ -glucuronidase activity in living TEs.

(C) 5-week-old floral stem of *pMAP70-5:GUS* showing  $\beta$ -glucuronidase activity in xylem tissues including TEs, xylary fibers (XF) and interfascicular fibers (IF). Note that ca indicates cambium.

A



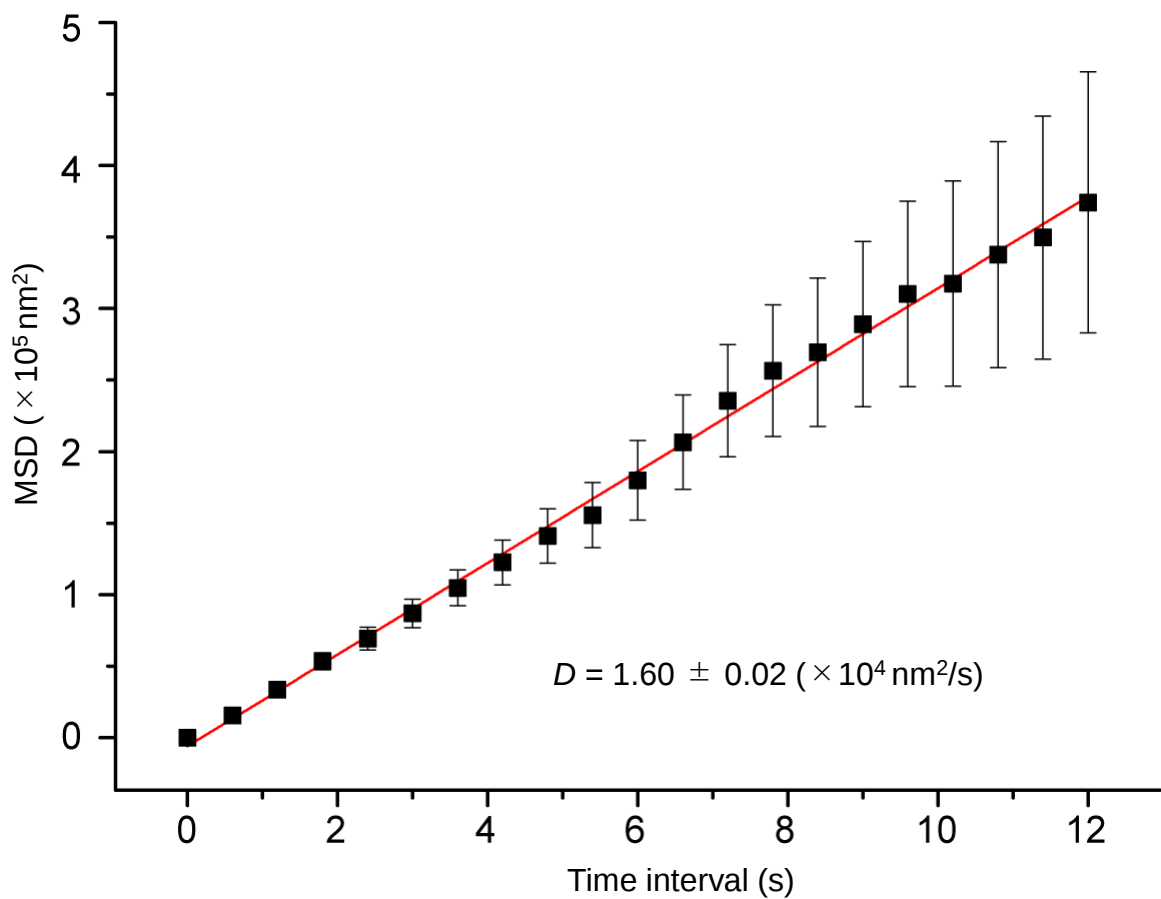
B



**Supplemental Figure 4. Ectopic MAP70-5 expression promotes microtubule bending in planta**

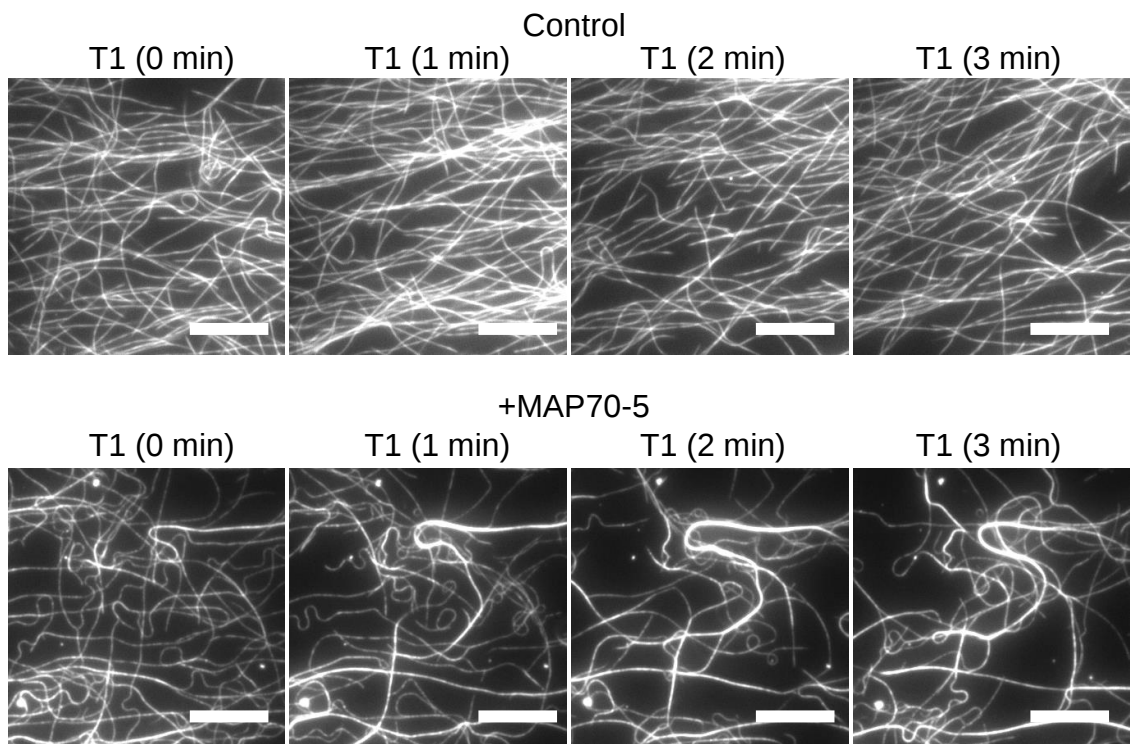
(A and B) TUB6 (*pUBQ10:YFP-TUB6*) (A) and MAP70-5 (*pLexA:YFP-MAP70-5*) (B) in leaf epidermal cells, hypocotyl epidermal cells, and root hairs. Seedlings were observed after 3-day-long treatment with estrogen. Arrowheads indicate circular bundled microtubules.

Scale bars: 20  $\mu$ m



### Supplemental Figure 5. MSD analysis of GFP-MAP70-5

Mean Square Displacement (MSD) analysis of the movement of 3 nM GFP-MAP70-5 molecules ( $n = 73$  traces). Bars indicate standard error. Value for diffusion coefficient ( $D$ ) from the linear fit (red line) of the data to  $\text{MSD} = 2Dt + \text{offset}$  is indicated.



**Supplemental Figure 6. Time series of gliding ATTO565-microtubules in the absence (Control) or presence (+MAP70-5) of 2  $\mu$ M GFP-MAP70-5.**

Observation began 10 sec after the addition of buffer (Control) or MAP70-5 (+MAP70-5).

Scale bars: 10  $\mu$ m

Supplemental Table 1 Primer list

| Primer name            | Sequence                                                        |
|------------------------|-----------------------------------------------------------------|
| MAP70-1-CFW            | ATTGATGCTGAGATCAAAGCGTTG                                        |
| MAP70-1-CRV            | AAACCAACGCTTTGATCTCAGCAT                                        |
| MAP70-5-CFW            | ATTGAGGAAGTTGGAGGAGAAACT                                        |
| MAP70-5-CRV            | AAACAGTTTCTCCTCCAACCTCCT                                        |
| MAP70-5-804-inF-R      | GCGCCACCCCTTCTACTCATCTTTCCACTC                                  |
| pEntr_TAG-F            | TAGAAGGGTGCGCGCGCCGAC                                           |
| MAP70-5-805-inF-F      | GCCCCCTTCACCATGAACGATAGAGTCATG                                  |
| pEntr_R                | CATGGTGAAGGGGCGCGC                                              |
| MAP70-5-301F           | ACTCACCAACAGGACGATGACTCTC                                       |
| MAP70-5-300del         | GTCCTGTTGGTGAGTCATGGTGAAGGGGGC                                  |
| MAP70-5-300R           | GTAACCCCTCCTTAGTGCTTCTTC                                        |
| MAP70-5-300-493-F      | CTAAGGAGGGTTTACTTGATTGTTGAAGAG                                  |
| MAP70-5-462R           | AGCACGTTCAAGGGCACTTCTC                                          |
| MAP70-5-462-655-F      | GCCCTTGAACGTGCTGGAGGAACAGCCGCC                                  |
| MAP70-5-654R           | TGCCAAGATCGCTTCCTCCAGTTC                                        |
| MAP70-5-654-805-InF-F  | gaagcgatcttggcaAACGATAGAGTCATG                                  |
| MIDD1-Ndel-inF-R-Long2 | GGTGAAGGGGGCGGCCGCGGAGCCTGCTTTTTGTACAAACTTGATGTACAGCTCGTCCATGCC |
| MIDD1-361-InF-F        | GCCGCCCCCTTCACCTCGGAAGATTCAAGAATTG                              |
| MIDD1pro-GFPf1         | TAAACTCCAAAAATGGTGAGCAAGGGCGAG                                  |
| MIDD1pro-r1            | TTTTGGAGTTTAAAAACCTTTTC                                         |
| MIDD1-f1               | ATGCAGACTCCAAAATC                                               |
| pEnt-MIDD1-r2          | TGGAGTCTGCATGGTGAAGGGGCGGCC                                     |
| caccMAP70-5f1          | CACCATGACTGCAGCAGAAAACCC                                        |
| MAP70-5-R              | CTGGCAACGTGGATTGGGTATG                                          |
| MAP70-5pro2kF          | CTCCGCGGCCGGGTCAGAATGATGATGGC                                   |
| proGUS-F               | CCGGTATAAGTCAACTGGCG                                            |
| proGUS-R               | TTTGTAGTCTCAACGGCTCCTCC                                         |