Article title: **Pentatricopeptide repeat protein DEK40 is required for mitochondrial function and kernel development in maize**

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Supplementary Fig. S1-S5

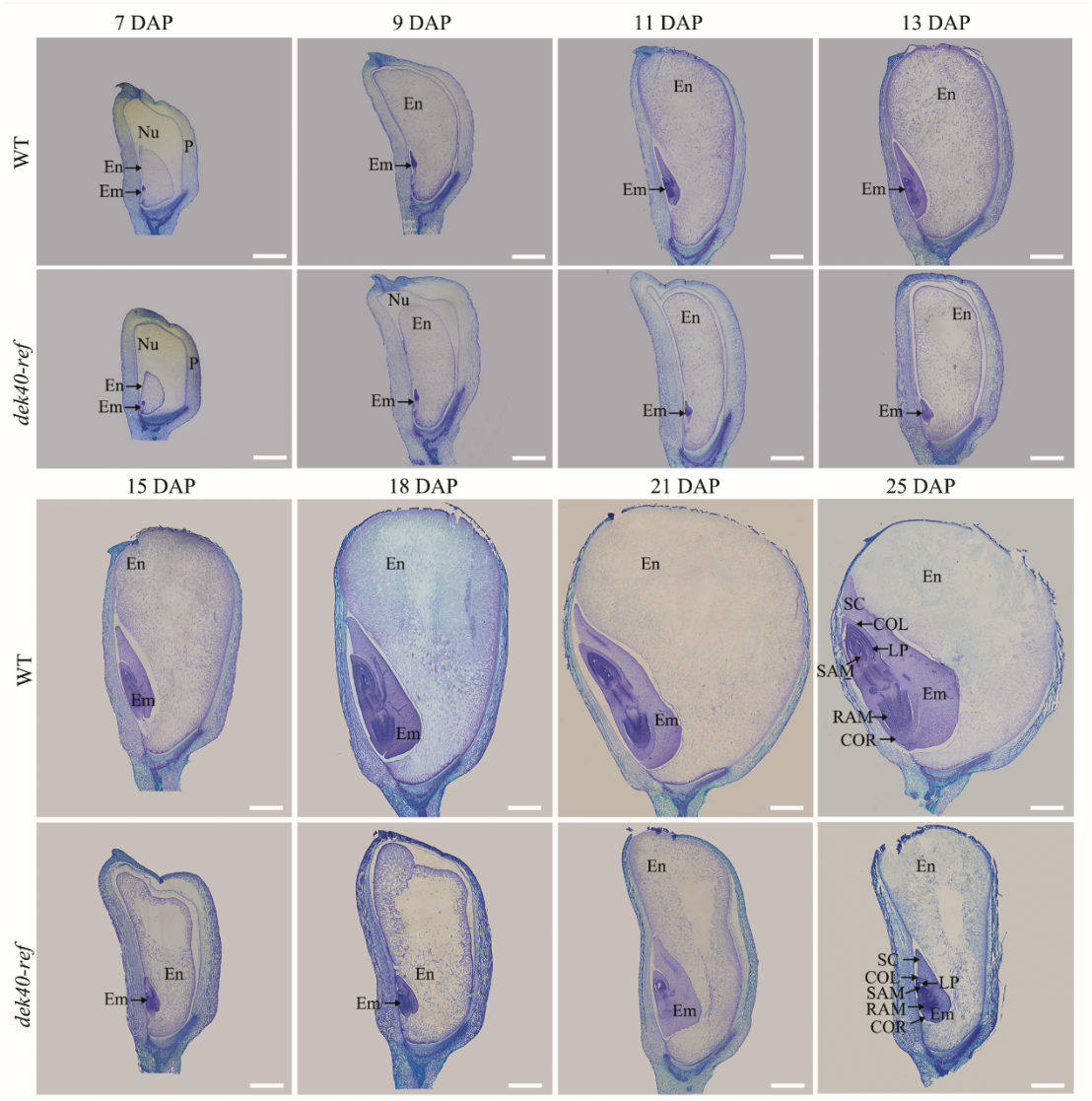

Fig. S1 Paraffin sections analysis of WT and *dek40-ref* kernels at different developmental stages

En, endosperm; Em, embryo; Nu, nucellus; P, pericarp; LP, leaf primordia; RAM, root apical meristem; SAM, shoot apical meristem; SC, scutellum; COL, coleoptile; COR, coleorhiza. Scale bars, 1 mm.

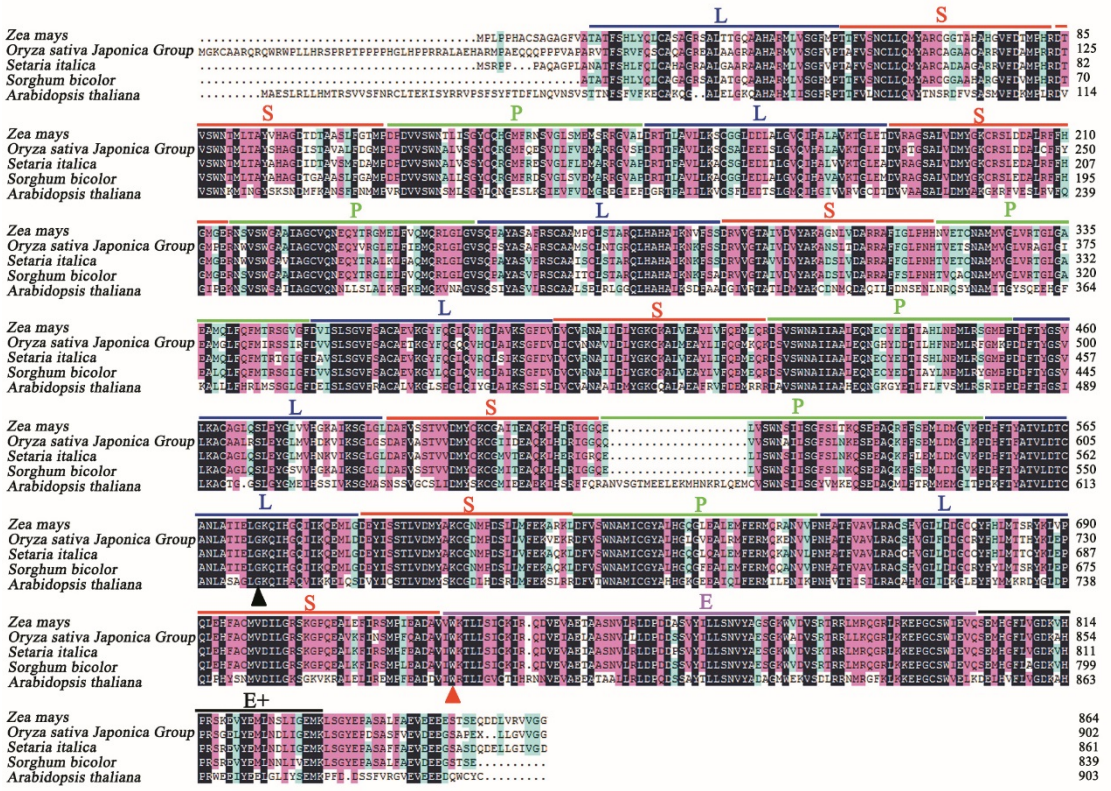

Fig. S2 Amino acids alignment of maize DEK40 with homologous PPR proteins in other plant species

PPR elements are indicated. S type is indicated by red line; L type is indicated by blue line; P type is indicated by green line; E domain is indicated by purple line; E+ domain is indicated by black line. The mutant sites in *dek40-ref* and *dek40*-1 are indicated by black arrowhead and red arrowhead, respectively.

Arabidopsis thaliana, sequence ID NP_186882.2; *Setaria italic*a, sequence ID XP_012698197.1; *Oryza sativa Japonica Group*, sequence ID XP_015612764.1; *Sorghum bicolor*, sequence ID XP_002441797.1; *Zea mays*, sequence ID XP_008662428.1. All data obtained from the NCBI (https://www.ncbi.nlm.nih.gov/).

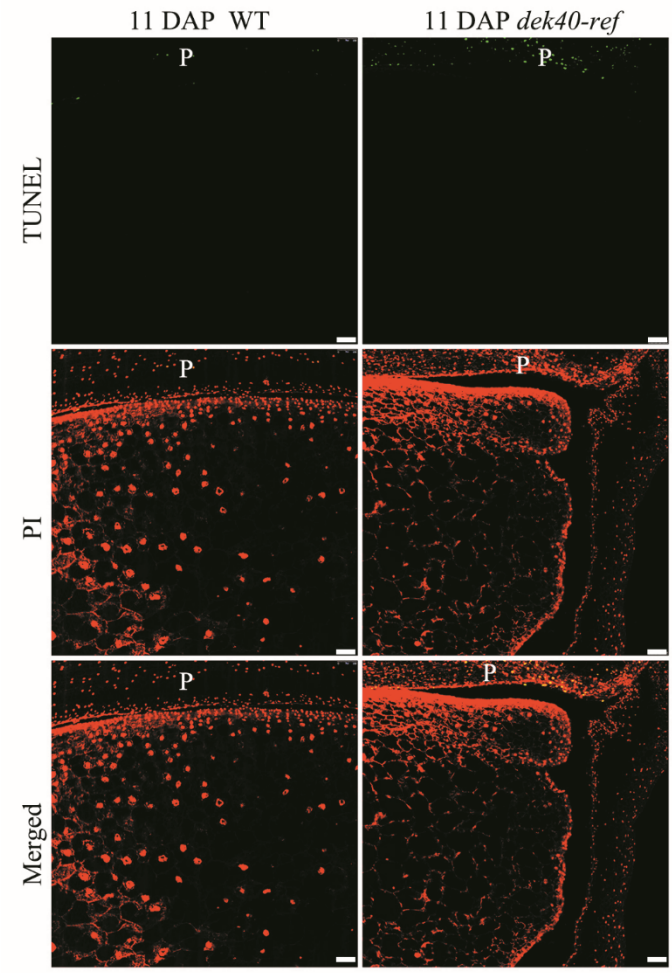

Fig. S3 Nuclear DNA fragmentation was detected in WT and *dek40-ref* endosperm at 11 DAP by TUNEL assay

The green is the TUNEL signals. The red is PI indicated nuclei. The yellow is merged of TUNEL detected nuclei and PI detected nuclei. P, pericarp. Scale bars, 100 μm.

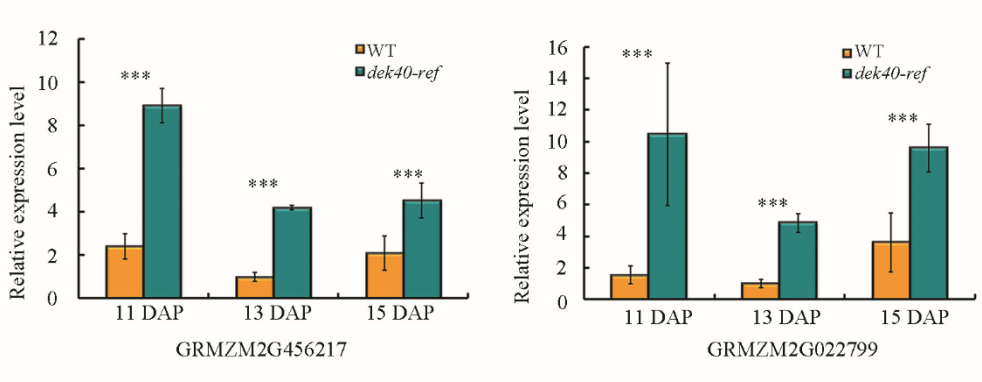

Fig. S4 The expression levels of PCD associated genes

The expression levels of PCD associated genes (Cysteine proteinase gene, GRMZM2G456217; Metacaspase gene, GRMZM2G022799) in WT and *dek40-ref* at 11, 13 and 15 DAP. Values and bars represent the mean and standard deviation of three biological replicates, respectively. The RNA levels were normalized to that of maize *ZmActin* gene (GRMZM2G126010). Significant differences are indicated. ***P* < 0.01, ****P* < 0.001 (Student's t-test).

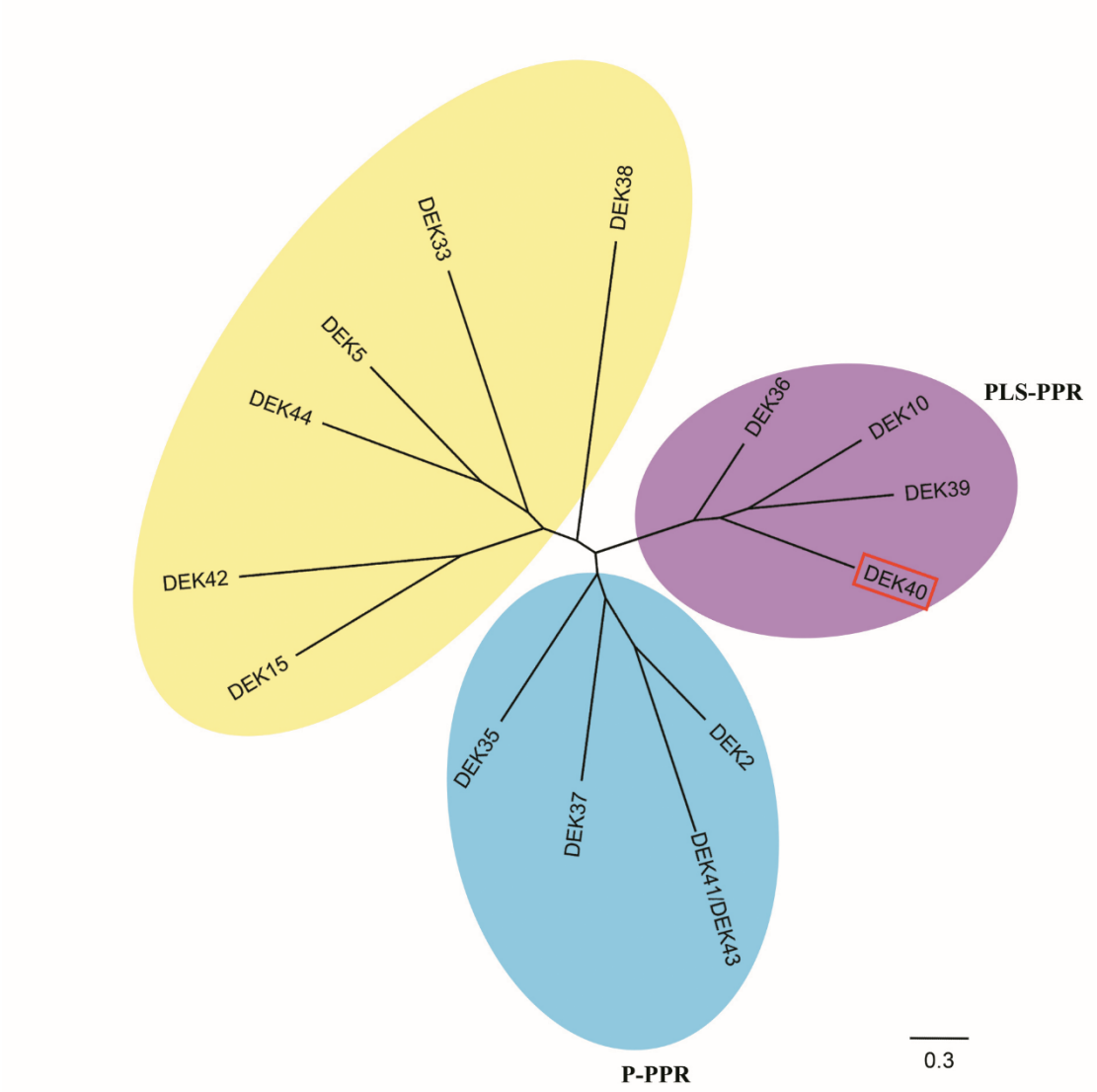

Fig. S5 Phylogenetic relationships between the DEK40 and other maize DEK proteins.

Several *Dek* genes involved in maize kernel development had been reported in previous studies. *Dek2* encodes a P-type PPR protein (Qi *et al.*, 2017b). *Dek5* encodes a protein homologous to rice SUBSTANDARD STARCH GRAIN4 (SSG4) and *E.coli* tamB (Zhang *et al.*, 2019). *Dek10* encodes an E subgroup PPR protein (Qi *et al.*, 2017a). *Dek15* encodes a homolog of SISTER CHROMATID COHESION PROTEIN 4 (SCC4) (He *et al.*, 2019). *Dek33* encodes the pyrimidine reductase in riboflavin biosynthesis (Dai *et al.*, 2019). *Dek35* encodes a P-type PPR protein (Chen *et al.*, 2017). *Dek36* encodes an E+ subgroup PPR protein (Wang *et al.*, 2017). *Dek37* encodes a P-type PPR Protein (Dai *et al.*, 2018). *Dek38* encodes a TTI2

(Tel2-interacting protein 2) molecular cochaperone (Garcia *et al.*, 2017). *Dek39* encodes an E subclass PPR protein (Li *et al.*, 2018). *Dek41*/*Dek43* encodes a P-type PPR protein (Zhu *et al.*, 2019). *Dek42* encodes an RRM_RBM48 type RNA-binding protein (Zuo *et al.*, 2019). *Dek44* encodes a putative 50S ribosomal protein L9 (Qi *et al.*, 2019). The purple part is PLS-type PPR proteins (PLS-PPR), the light blue part is P-type PPR proteins (P-PPR), the yellow part is other types proteins. DEK40 is indicated in red box. Bar, 0.3.

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