**Number of Fruits**

12

10

4

Wild type

*mpk18*

**A**

150

100

0

**Number of Seeds**

**B**

50

200

250

Wild type

*mpk18*

**Figure 1** Mutations in *MPK18* decrease plant fitness. Wild-type and *mpk18* plants were

grown in soil until maturity, and the number of fruits and seeds produced per plant were counted. (**A-B**) Boxplots showing the number of fruits (**A**) and seeds (**B**) produced per plant. The top, middle, and bottom of each box are the 75th, 50th (median), and 25th percentiles, respectively. The whiskers show 1.5 times the inter-quartile range. \*\*\*Significant difference between wild type and *mpk18* (*P* < 0.0001; Student’s t-test). *n*=28.

2

6

14

8

\*\*\*

**Results**

 Wild-type and *mpk18* seeds were sown in flats filled with a mixture (1:1:1) of SUREMIX, vermiculite, and perlite. After sowing, the seeds were kept at 4°C for two days to break dormancy. Flats were then transferred to a growth chamber set at 21°C and a 16 h day/8 h night photoperiod, and plants were grown to maturity. Wild-type and *mpk18* mutant plants flowered at almost the same time (day 20 and day 21, respectively), produced similar numbers of leaves (10.255 and 10.555, respectively), and were nearly identical in height (20.333 cm and 19.898 cm, respectively). Wild-type plants (1.30 g) weighed more than *mpk18* mutant plants (1.25 g). There was no difference in fruit number between wild type and *mpk18* (8.58 and 8.46, respectively), but there was a difference in seed number (150.71 and 71.6, respectively) (Figure 1).

**Discussion**

 Many *Arabidopsis* mutants do not have an obvious phenotype (Bouche and Bouchez, 2001). This may be due to genetic redundancy (i.e., two or more genes share overlapping functions), but it is also possible that mutant phenotypes are subtle or conditional. *MPK* genes have been shown to function in both development and defense (reviewed in Hamel et al., 2006). Here we found that *mpk18* mutant and wild-type plants flowered at the almost the same time, produced similar numbers of leaves, and were nearly identical in height. Wild-type plants weighed more than *mpk18* mutant plants. Although *mpk18* plants looked the same as wild-type plants, we could see potential differences in root structure. There was no difference in fruit number between wild type and *mpk18*, but there was a difference in seed number (Figure 1). The fact that *mpk18* produces the same number of fruits as wild type but fewer seeds is significant. Fruit number is often used instead of seed number as a measure of fitness (Kerwin et al., 2015). By applying our approach to the analysis of other mutants, we will dramatically increase the number of genes with known functions.

**References**

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