

Evaluation of fruit size and seed number in triploid and tetraploid *Malus spp.*

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Introduction

A major goal of ornamental plant breeding projects is to develop novel cultivars tolerant to biotic and abiotic stresses that do not escape cultivation. To that end, fruit size and plant fertility are often manipulated. Fertility reduction is a major goal of many plant breeding programs in order to help reduce escapes from cultivation.

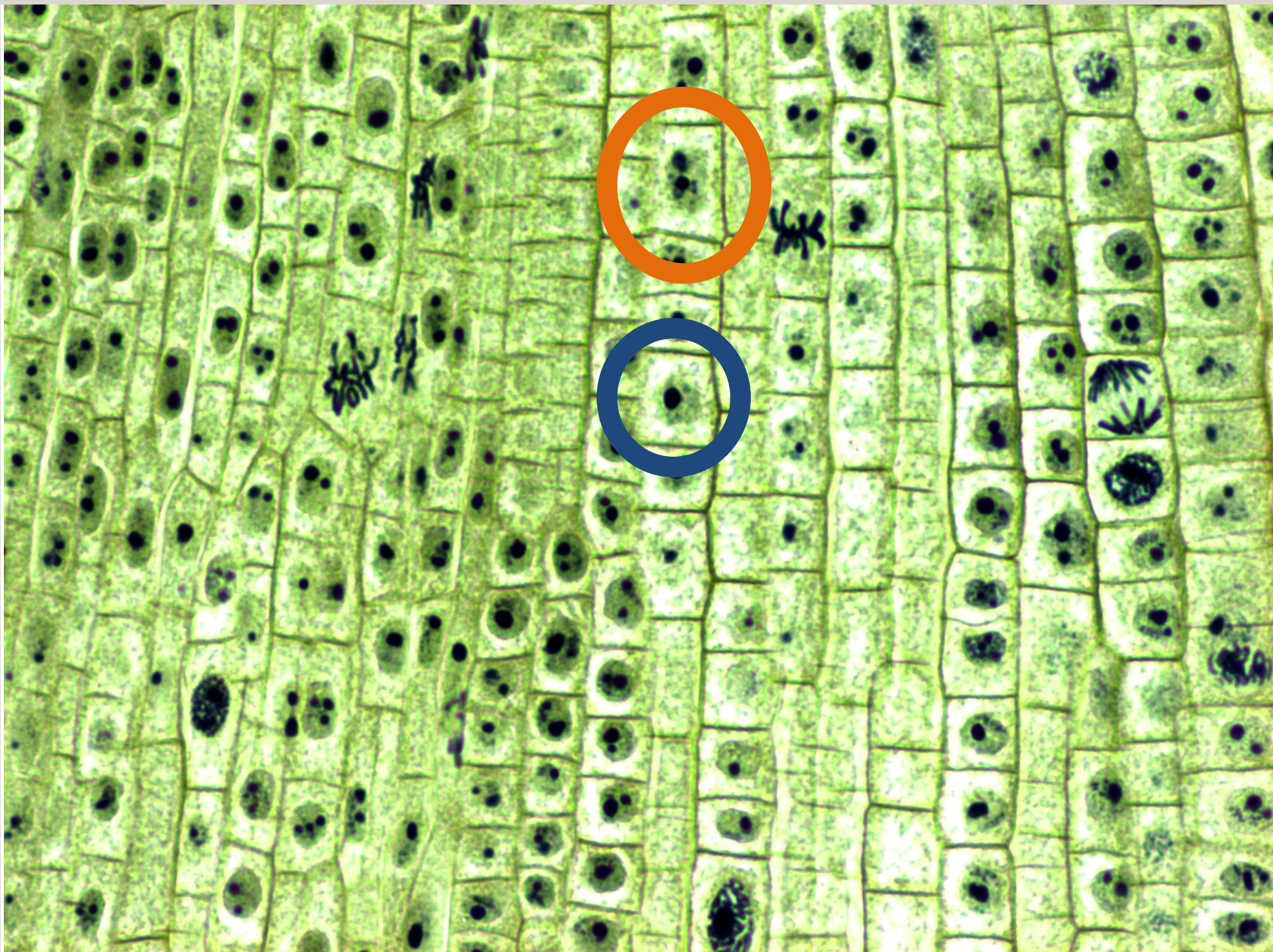
In *Malus domestica*, spontaneous endoreduplication resulting in tetraploid fruit tissue has been associated with increased fruit diameter and mass (Malladi 2010). Triploid plants may be sterile (Ranney 2006). Polyploidy can be induced in situ through oryzalin treatment (Kermani et al 2003).

For the production of a new ornamental *Malus* species, it is necessary to evaluate the effects of polyploidy on fruit development.

Increased seed number has also been associated with fruit size in *Malus* (Bramlage 1990).



Grand Gala apples, at right, undergo endoreduplication, creating tetraploid (4x) tissue which causes cells to grow larger than in the regular Gala apples (diploid, 2x), at left. (Purdue University photo/Peter Hirst)



Size differences between normal diploid cells (blue oval) and tetraploid cells during mitosis (orange oval) can be readily observed. (Photo/ Ag. and Soil Sciences Academy)

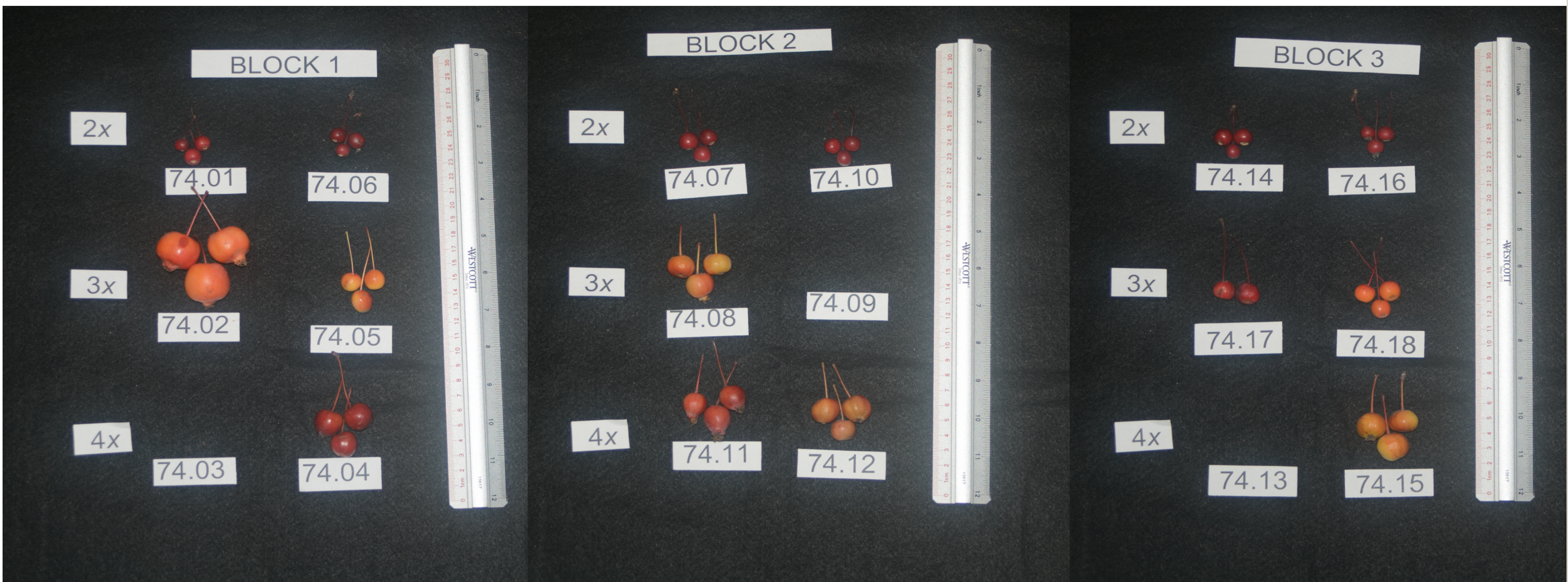
Materials and Methods

- A crabapple (*Malus* sp.) was doubled through in-situ oryzalin treatment.
- The resulting tree was planted and allowed to be open pollinated.
- Seeds were collected and germinated
- Ploidy was assessed by flow cytometry.
- Six triploid, six tetraploid and six *Malus* x ‘Prairiefire’ were planted in three randomized blocks.
- Trees were allowed to be open pollinated.
- Up to five crabapples were collected from each tree and assessed.



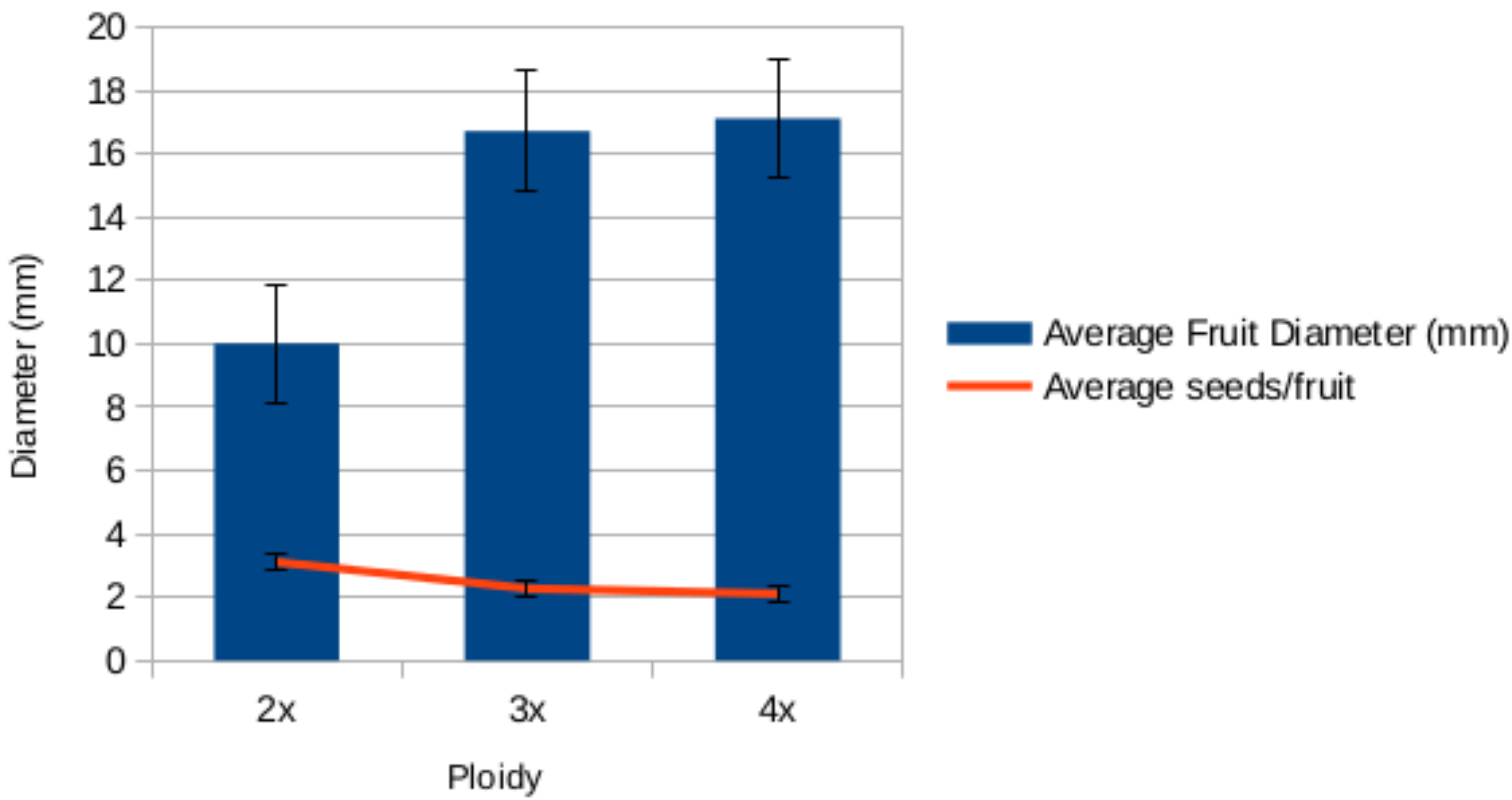
Selected diploid and accessions and reference ‘Prairiefire’ in replicated, randomized block at Lewis-Brown Farm in Corvallis, OR.

Results and Conclusion



Pomes collected from study trees. Fruit size, shape and color were highly variable among test accessions. *Malus* x ‘Prairiefire’ controls are very regular. Accessions 74.09, 74.03 and 74.13 did not produce fruit in 2015. Further evaluation is needed before an assertion of sterility can be made.

Average Fruit Diameter vs Seed Number



No significant difference was found in seed number among accessions (two way ANOVA, p values ranging 0.81-0.99 between groups). No significant difference in pome diameter was observed between triploid and tetraploid accessions (two way ANOVA, p value 0.97). There is a significant difference in average fruit diameter between diploid and polyploid pomes (two way ANOVA, 2x-3x P value 0.013, 2x-4x p value 0.012).