Soil fertility drives yield gains and losses of grafted tomatoes in Nebraska

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**Introduction**

Grafting has been successfully used in vegetable production like tomato, pepper, eggplant, cucumber and watermelon. Other than its usefulness for managing soil-borne diseases, studies have shown that grafting tomatoes with rootstocks like ‘Maxifort’ and ‘Estamino’ can improve nutrient uptake and yield. Grafting creates a new plant with a combination of desirable above- and belowground attributes from selected scion and rootstock plants. However, only a few studies have assessed the effects of grafting and soil fertility management on yield of open field-grown tomatoes in the Midwest. Thus, there is a need to better document the effects of grafting heirloom and hybrid tomato cultivars onto hybrid tomato rootstocks on tomato yield and quality.

**Objective**

Improve fresh market tomato yield, nutrient uptake, drought tolerance, and disease resistance in Nebraska through the use of grafted rootstocks.

**Methods**

In 2017, the determinant heirloom tomato ‘Nebraska Wedding’ was grafted onto two rootstocks, ‘Estamino’ and ‘Maxifort’ (Table 1). Non-grafted and self-grafted ‘Nebraska Wedding’ plants were controls. Plants were grown at two locations: high fertility soil in (1) Lincoln, NE, and low fertility soil in (2) Mead, NE as a strip-strip plot. Five tomato plant replicates of the four rootstock treatments received one of four fertilizer treatments (Table 3.).

In 2018, two determinant fresh market tomatoes, ‘Nebraska Wedding’ and ‘BHN-589’, were grafted onto two rootstocks, ‘Estamino’ and ‘Maxifort’ (Table 4). Non-grafted ‘Nebraska Wedding’ and ‘BHN-589’ plants were controls. Plants were grown at three different locations: high fertility soil in (1) Lincoln, NE, low fertility soil in (2) North Platte, NE, and high fertility soil in (3) Dwight, NE as a randomized complete block design. Five tomato plant replicates of the six grafting treatments received fertilizer treatments with recommended NPK rate.

**Data Collection:**

- Tomatoes were harvested weekly and bi-weekly during later season at each location.
- Yield was determined by weighing all tomatoes from the five plants in each experimental unit.
- Data were analyzed for effects of grafting treatment, location, and their interaction.

**Results 2017**

- In high fertility soil, grafting to EST or MAX reduced yield by 41% and 48% relative to NG plants (Fig. 2.).
- Fertilizer treatments did not affect tomato yield in the high fertility soil, but did increase leaf nutrition (Fig. 3.).
- In low fertility soil, tomatoes grafted to EST had 20% greater yield than NG plants (Fig. 4.).
- MAX rootstocks did not increase yield compared to NG in low fertility soil (Fig. 4.).
- Fertilizing with Ca(NO\(_3\))\(_2\) alone and YWN increased tomato yield in the low fertility soil (Fig. 5.)

**Results 2018**

- In all 3 locations, ‘BHN 589’ yield was greater than ‘Nebraska Wedding’
- In high fertility soil, grafting NW to EST or MAX reduced yield relative to non-grafted plants (Fig. 6, 7.).
- In low fertility soil, grafting NW to EST or MAX increased yield relative to non-grafted plants (Fig. 8.).
- Grafting BHN to EST or MAX increased yield relative to non-grafted plants in the lower fertility soil (Fig. 7, 8.).