Pollenizer Variety Does Not Influence Anthracnose Severity or Watermelon Production

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Introduction

Anthracnose of watermelon is perhaps the most important foliar disease of watermelon in the US. Symptoms of this disease include irregular necrotic lesions on leaves, spindle shaped lesions on stems and sunken lesions on fruit. Yield reductions can result directly from fruit with anthracnose lesions or indirectly from foliage loss (Sitterly and Keinath, 1996).

The severity of anthracnose can be reduced through crop rotation and fall tillage. However, most growers find it necessary to apply foliar fungicides in order to reduce levels of anthracnose in the field. These fungicide applications represent a major expense for watermelon growers and yet may not adequately reduce anthracnose severity.

Host resistance represents perhaps the most efficient method of anthracnose control. However, there is no measurable resistance in seedless watermelon hybrids. Although some watermelons are resistant to race 1 of anthracnose, race 2 is the predominant race that causes economic damage to watermelons in the US (Wasilwa, 1993).

While there is no useful resistance in seedless watermelon hybrids, diploid varieties that are used solely to produce pollen for seedless watermelon vary significantly in anthracnose reactions. In two years of field trials, Saha and Egel (*unpublished data, supported in part by Illiana watermelon Association*) showed that 15 varieties of watermelon used commonly for pollination purposes range from almost completely resistant to very susceptible.

The objectives to the research presented below are:

1. Determine whether the use of pollenizer varieties that vary in resistance to watermelon anthracnose:
    a. Influences the amount of anthracnose observed on the foliage of seedless watermelon interplanted with the pollenizer.
    b. Influences the yield of interplanted seedless varieties either directly by causing lesions on the fruit of seedless varieties or indirectly by reducing foliage via lesion production.
2. Determine the quantitative relationship, if any, between pollenizer varieties that vary in anthracnose susceptibility and seedless watermelon production.

The information discussed below is a report to the National Watermelon Association on sponsored research.

Materials and Methods

All experiments were conducted at the Southwest Purdue Agricultural Center in Vincennes, IN and at the University of Kentucky Horticultural Research Farm in Lexington, KY. Production of seedless watermelon closely followed methods developed for the annual Purdue University watermelon trial (Saha et al., 2013). The experiments were planted into the field as transplants on 21 May in both Vincennes and Lexington. A water-wheel setter was used to set transplants in the field in mid-May. 250 ml of a 20-20-20 solution of soluble fertilizer was added with each transplant. All fertilizer applications were pre-plant including 350 lbs. (46-0- 0), 100 lbs. (0-0-60), and 200 lbs. of pelletized lime per acre. Each row was mulched with 4-ft wide x 0.16 in. black plastic (Visqueen 4020) and irrigated as needed by drip tape. The seedless variety used was Fascination. The pollenizer varieties selected were, in order of susceptibility: Ace, Mickylee, Accomplice and SP-6.

Each row was 48 feet long and consisted of 12 seedless and 6 of one of the pollenizer varieties. Seedless watermelon were grown 4 feet apart within rows with a pollenizer spaced 2 feet apart between pairs of seedless watermelon plants. Rows will be 8 feet apart; vines from each row were kept separate so that yield and disease severity data could be collected for each replication. Management of pests was conducted according to recommendations of the *Midwest Vegetable Production Guide for Commercial Growers 2015* (Egel et al., 2015).

The experimental design was a split plot with the main plot comparing rows either inoculated or not inoculated with the anthracnose pathogen and the sub plot comparing pollenizer varieties. Each 48-foot row will be a replication. There will be 4 replications.

Watermelons leaves with symptoms of anthracnose race 2, caused by *Colletotrichum orbiculare*, were collected from local commercial fields and inoculated into plots on 29 June in Vincennes and on 7 July in Lexington.

Disease severity was collected on each treatment using the Horsfall-Barratt rating scale approximately weekly. Fruit were harvested for yields on 29 July, 7 and 18 August in Vincennes and on 3,10 and 17 August in Lexington.

Results and Discussion

Symptoms of anthracnose were first observed on 9 July in Vincennes and on 28 July in Lexington. Disease symptoms were rated on 14 and 27 July, 3 and 10 August in Vincennes and on 10 and 17 August in Lexington.

Although the trial consisted of inoculated and non-inoculated plots, symptoms of anthracnose could be found across all plots, regardless of inoculation status. Except for the first rating period in Vincennes on 14 July (data not shown), there were no differences noted in the amount of disease in the inoculated versus non-inoculated plots. This may have been due to the exceptionally rainy weather that was very conducive for anthracnose.

Since there were no significant differences in disease severity in inoculated versus non-inoculated treatments, the variety data from across inoculation/non-inoculated treatments could be combined. Thus, there were 8 replications for each variety treatment.

There were no significant differences in anthracnose severity across varieties in either location (Figures 1, 2 and 3). The reason for this lack of difference may have been that anthracnose spread very quickly under the conducive conditions, masking both inoculation status and variety treatments. Previous work by the authors has shown that the varieties of pollenizer used here vary greatly in anthracnose susceptibility; it is reasonable to assume that more susceptible varieties produce more fungal inoculum. Once produced, however, the anthracnose inoculum may have spread easily to other plots regardless of pollenizer variety.

Yield from experimental plots was also used to measure whether pollenizer susceptibility to anthracnose influenced triploid production. There were no differences in yield in number (Figure 5 and 6) or weight per acre (Figure 4 and 7) regardless of variety of pollenizer used in the treatment plots. This lack of difference in yield corresponds to the lack of difference in disease severity.

It is possible, however, that variety of pollenizer variety would affect triploid yields regardless of anthracnose severity (Dittmar et al., 2010). This might occur because pollenizer varieties differ in pollen production. However, no yield differences were noted. Thus, variety did not affect yields due to pollenation characteristics or susceptibly to anthracnose.

Originally it was proposed that yield differences for this study be measured through the proportion of non-inoculated to inoculated plots. This was proposed to avoid differences in yield due to the pollenizer varieties. Although no differences in yields due to pollenizer variety were observed and no differences in anthracnose severity due to inoculation status were observed, the proportion yield differences are shown in Figure 10. There were no significant differences observed.

Watermelon that were not marketable due to anthracnose lesions (culls) were observed in the Vincennes location. Again, no significant differences in number or weight of culls were observed due to pollenizer variety used in the plots (Figures 8 and 9).

The purpose of this study was to determine whether the use of specialized pollenizer varieties that differ in susceptibility to anthracnose would affect disease severity or production of triploids that accompanied the pollenizers. None of the parameters measured in either location would seem to indicate that pollenizer susceptibility affects triploid production. Based on the results of these studies completed in two locations, it is not necessary to consider pollenizer susceptibility to anthracnose when managing for this disease.

It is possible that another experimental design would have given different results. For example, if much larger plots had been used, then the spread of anthracnose spores from a plot with a susceptible variety to a plot with a resistant variety would have been less likely. Such an experimental design would require much more space and would be difficult to implement.

Nevertheless, our recommendation remains that it is not necessary to consider pollenizer susceptibility to anthracnose for disease management. It would be prudent for watermelon growers, however, to note fields where anthracnose is severe. If disease severity seems to correspond to a particular pollenizer variety, it may make sense to re-visit this question with future research.

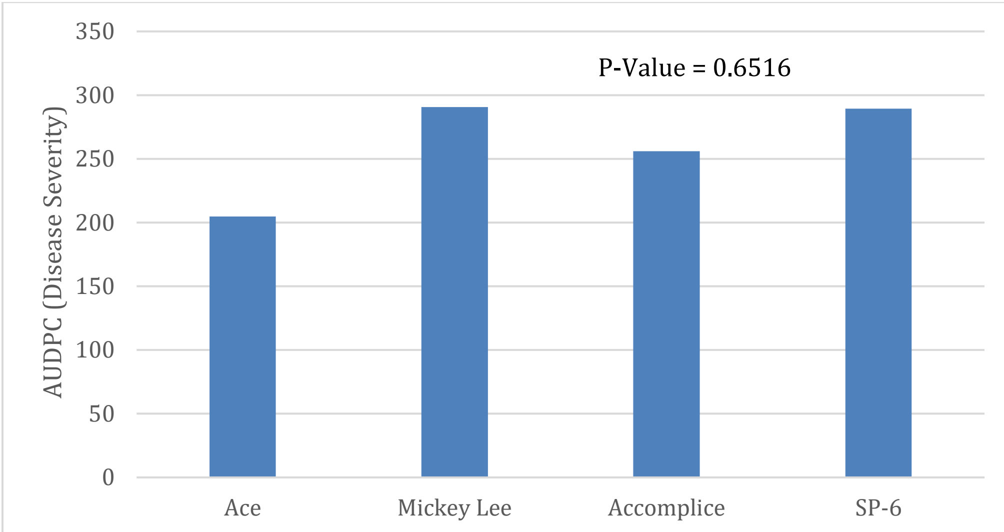

Figure 1: Anthracnose severity on the foliage of the triploid watermelon Fascination as measured by Area Under the Disease Progress Curve (AUDPC) in plots pollenized by one of the four varieties mentioned above in Vincennes. AUDPC was calculated by trapezoid integration from weekly ratings taken with the Horsfall-Barratt scale. There were no significant differences in AUDPC for the treatments.

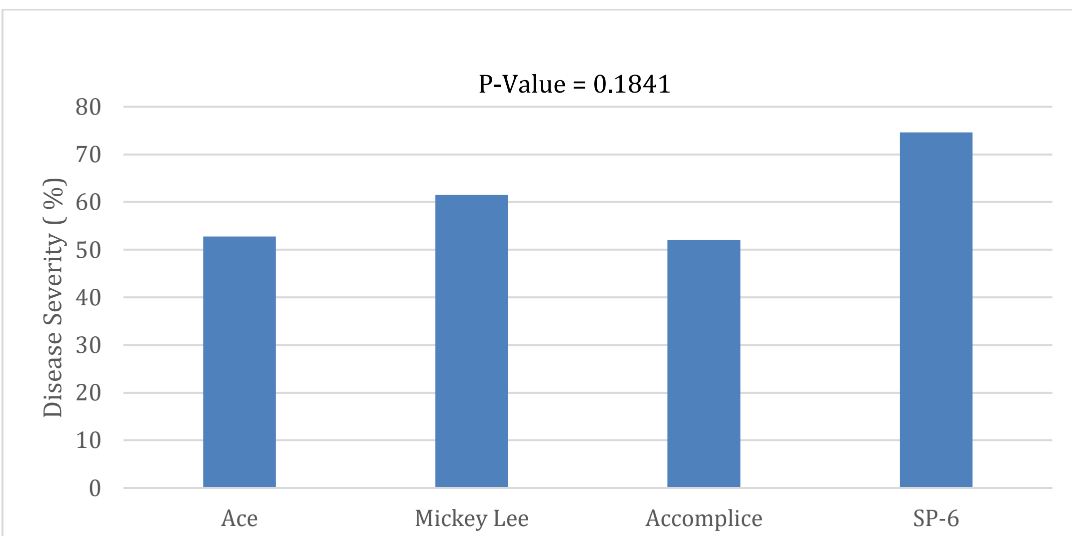

Figure 2: Anthracnose severity on the foliage of the triploid watermelon Fascination pollenized by one of the four varieties mentioned above on August 10, 2015 using the Horsfall-Barratt rating scale in Lexington. There were no significant differences in disease severity for the treatments.

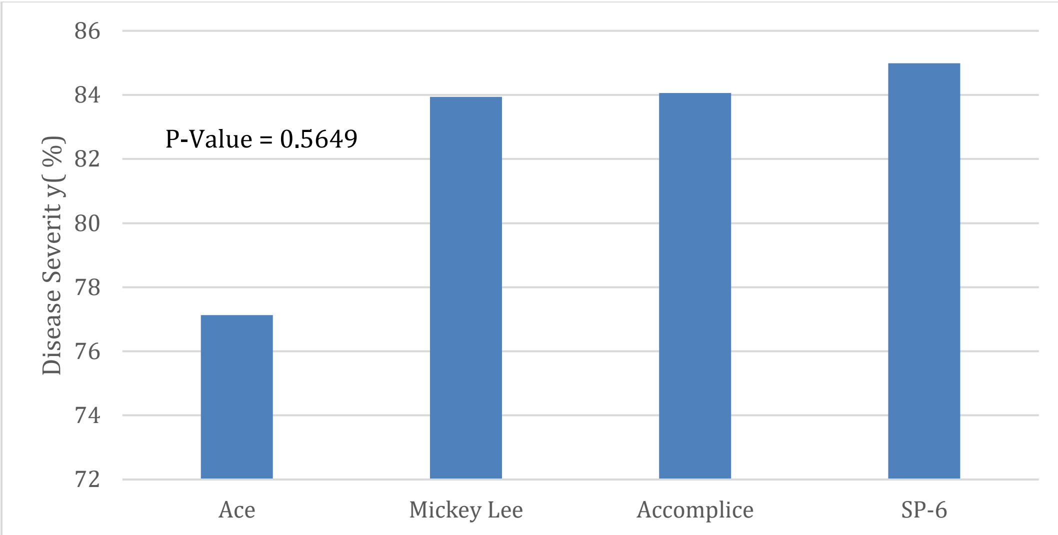

Figure 3: Anthracnose severity on the foliage of the triploid watermelon Fascination pollenized by one of the four varieties mentioned above on August 17, 2015 using the Horsfall-Barratt rating scale in Lexington. There were no significant differences in disease severity for the treatments.

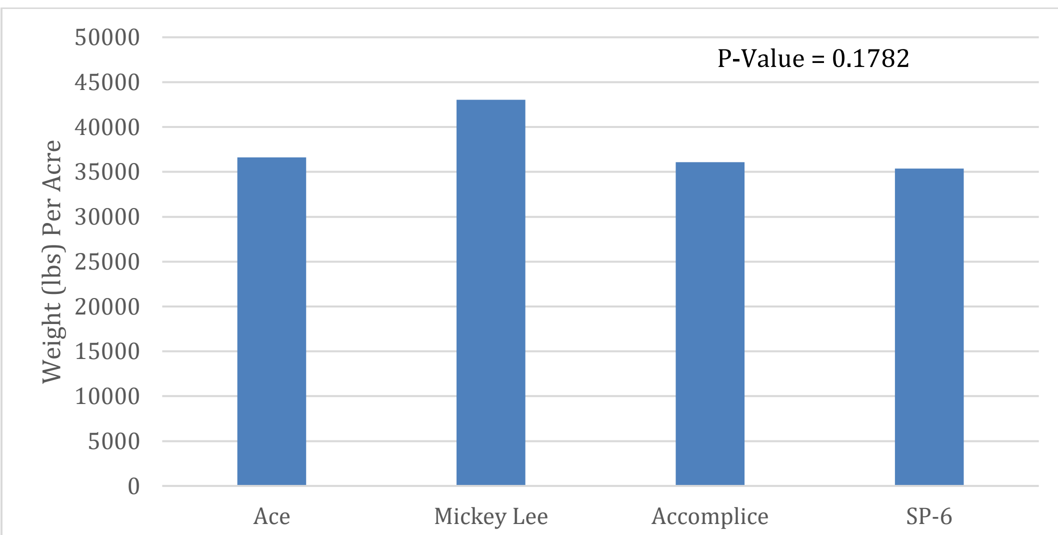

Figure 4: Weight per acre of marketable triploid watermelon fruit Fascination in treatments pollenized with one of the varieties shown above in plots with anthracnose in Vincennes. There were no significant differences in weight fruit per acre.

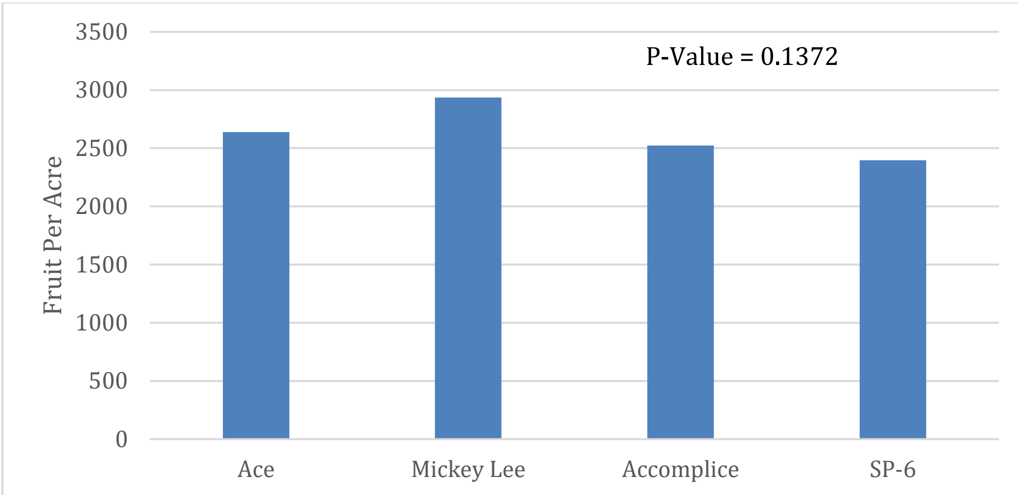

Figure 5: Number per acre of marketable triploid watermelon fruit Fascination in treatments pollenized with one of the varieties shown above in plots with anthracnose in Vincennes. There were no significant differences in number fruit per acre.

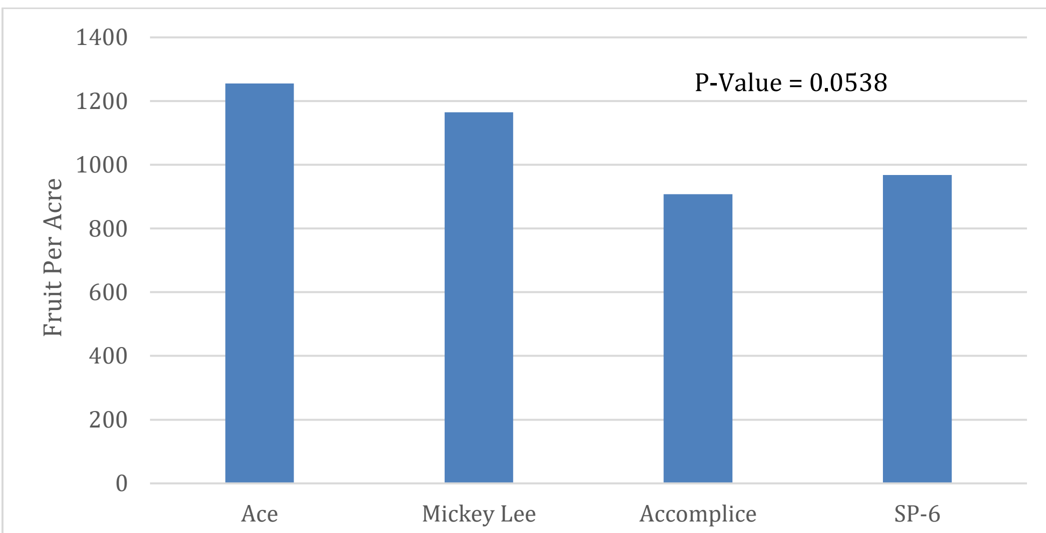

Figure 6: Number per acre of marketable triploid watermelon fruit Fascination in treatments pollenized with one of the varieties shown above in plots with anthracnose in Lexington. There were no significant differences in number fruit per acre.

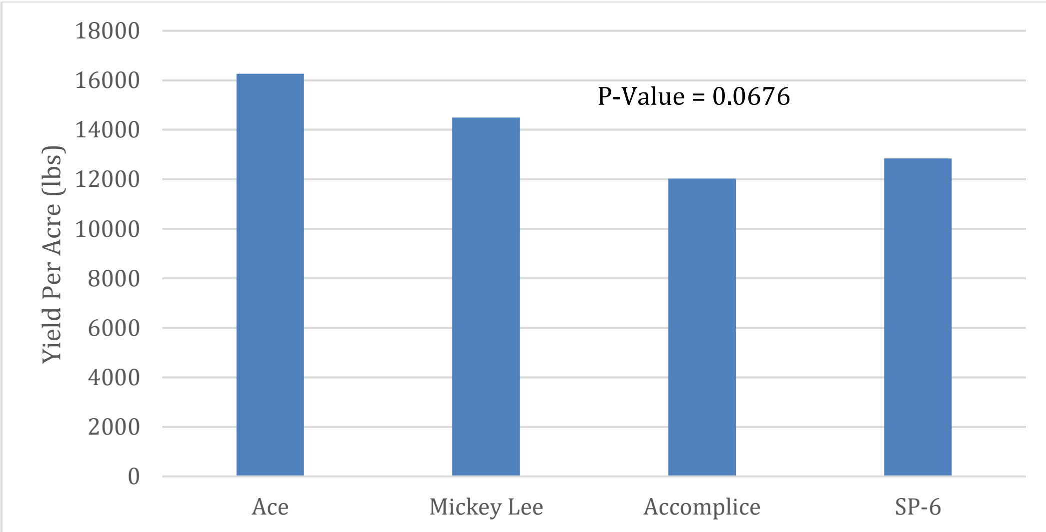

Figure 7: Weight per acre of marketable triploid watermelon fruit Fascination in treatments pollenized with one of the varieties shown above in plots with anthracnose in Lexington. There were no significant differences in weight fruit per acre.

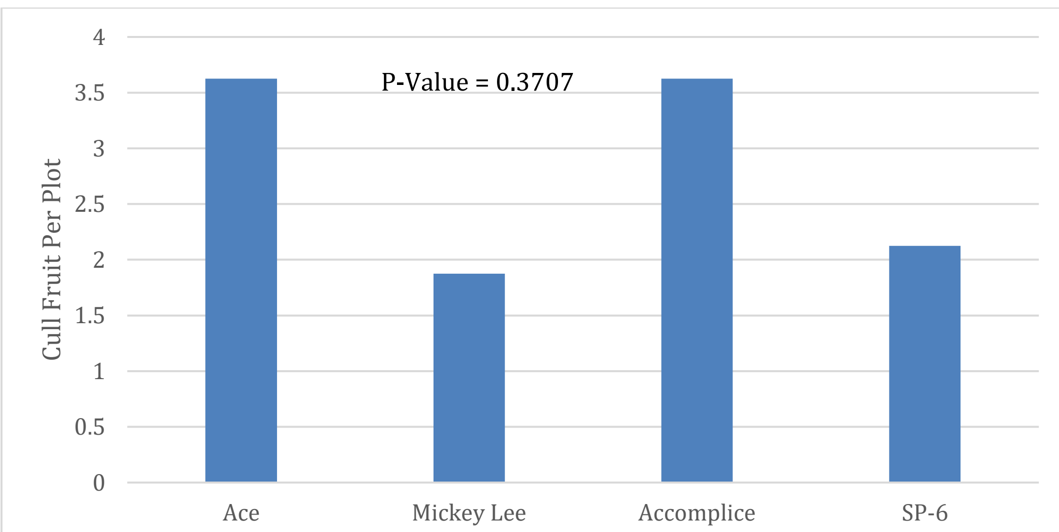

Figure 8: Influence of pollenizer variety on number of triploid watermelon Fascination fruit per acre that were not marketable due to anthracnose lesions in Vincennes. There were no significant differences in fruit per acre as a result of the pollenizer variety treatments.

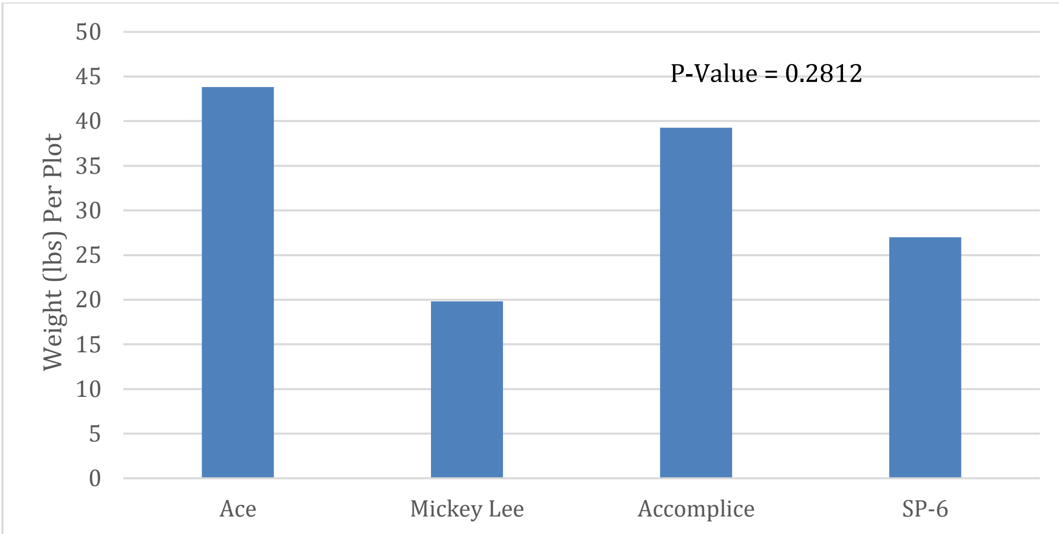

Figure 9: Influence of pollenizer variety on weight of triploid watermelon Fascination fruit per acre that were not marketable due to anthracnose lesions in Vincennes. There were no significant differences in fruit per acre as a result of the pollenizer variety treatments.

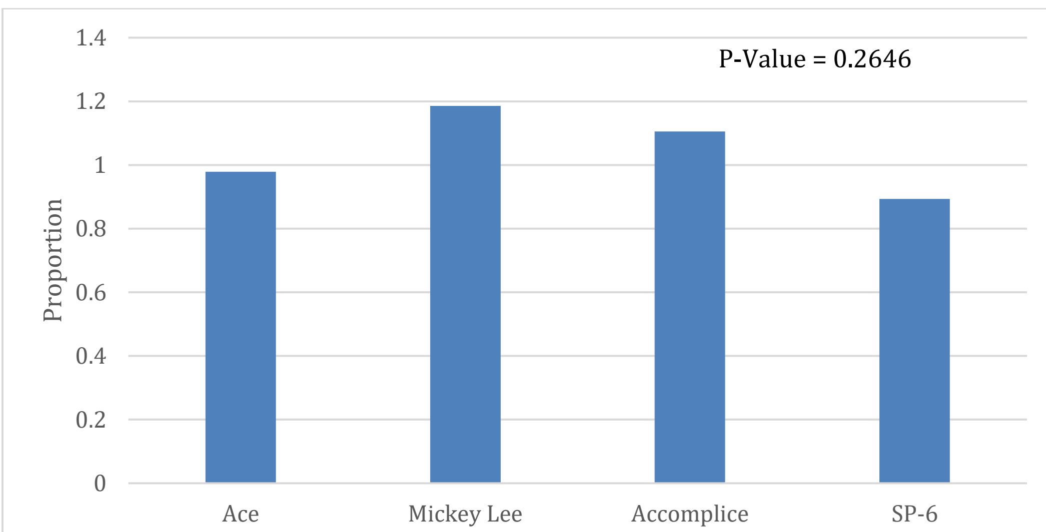

Figure 10: Proportion of non-inoculated over inoculated yield in weight per acre as influenced by pollenizer variety plots with anthracnose in Vincennes. There were no significant differences observed.

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