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CARIBBEAN FOOD CROPS SOCIETY

49

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Annual Meeting 2013**

**Port of Spain, Trinidad and Tobago
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EVALUATION OF FIRST AND THIRD GENERATION SORREL FOR PLANT VIGOR

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ABSTRACT: Sorrel, *Hibiscus sabdariffa*, has autogamous flowers that self-pollinate prior to flower opening resulting in inbred varieties. Cross pollination of inbred plants normally results in hybrid with vigor that out-perform both parents. Two varieties of red sorrel, 'TTB', which is deep crimson and open, and a 'KDN', which is day neutral and red, were used as parents. 'TTB' was late flowering with a crimson fruit and 'KDN' was day-neutral with red fruit. The objective was to study two parental sorrel lines and the F₁ and F₃ progeny to evaluate plant vigor for production, floral initiation, fruit color and shape. Selection of plants from the F₂ population were used to obtain seed for the F₃ progeny. Plant vigor was determined by measuring plant height and number of branches at two week intervals as well as recording when floral buds became visible. Though the F₁ population of 'TTB' x 'KDN' had a trend of being taller than the parents, it wasn't significant for plant height and branch development. The F₃ populations were significantly taller than the F₁ and parent varieties. The F₁ and F₃ 'TTB'x'KDN' plants initiated flowers at the same time as 'TTB' which was two weeks later than 'KDN'. However, the F₃ line of 'KDN'x'TTB' initiated flowers at the same time as 'KDN' indicating a new day neutral variety. Hybrid vigor can be obtained from specific controlled crosses in sorrel. The day neutral characteristic can be recovered in F₃ population where 'KDN' was the female parent. This research was funded through USDA-NIFA- Insular Tropical Grant funds and USDA-NIFA-SCBG from the VI Department of Agriculture.

Keywords: *Hibiscus sabdariffa*, roselle, hybrid, breeding

Introduction

Sorrel (*Hibiscus sabdariffa* L.), also known as roselle is an annual plant that is part of the Malvaceae family and is grown in tropical and subtropical regions for stem fibers, paper pulp, edible calyces, leaves and seeds. Sorrel has autogamous flowers that self-pollinate prior to flower opening resulting in inbred varieties (Vaidya, 2000). Akpan (2000) reported an outcrossing rate of <1% in sorrel based on experiments conducted adjacent to breeding nurseries. Cross pollination of inbred sorrel plants normally results in hybrid with vigor that out-perform both parents (Ibrahim and Hussein, 2006). The objective was to study two parental sorrel varieties and the F₁ and F₃ progeny to evaluate for plant vigorous growth and floral initiation.

Materials and Methods

Seeds of two parental lines, St Kitts day-neutral 'KDN' and Trinidad black 'TTB', were used in reciprocal crosses to develop F₁ hybrid 'TTB'x'KDN'. 'TTB' was late flowering with dark crimson fruit and 'KDN' was day-neutral with red fruit. Controlled pollinations,

between the two varieties, were used to develop the F_1 hybrids (Fig. 1). From the first year F_1 hybrids 'KDN'x'TTB' and 'TTB'x'KDN' were randomly selected to for F_2 seeds. The F_2 plants were grown the previous year and seeds selected from 'KDN'x'TTB' and 'TTB'x'KDN' plants to develop an F_3 population for this experiment. Seeds of the parents, F_1 and F_3 populations were planted in 36 cell trays in early August and the seedlings transplanted to the field in late August. The seedlings were planted 60 cm apart within rows and 150 cm between rows. Drip irrigation was used to water and fertilize the plants. The plants were maintained by regular hand weeding of the field. Data was recorded at two-week intervals on sorrel plant height, number of branches and floral bud initiation. Data was analyzed using ANOVA and mean separation using Tukey's test.

Results and Discussion

The sorrel established quickly but both parents and the F_1 and F_3 plants experienced some iron chlorosis from the high pH calcareous soil which was corrected with the use of the chelated iron Fe-EDDHA. All varieties of sorrel grew to provide an increase in plant height over several weeks. The F_3 hybrids were significantly taller than the parents and F_1 hybrid (Figure 2) by the 55th day and at the 70th day. The same trend occurred with the number of branches that developed (Figure 3). When the parents were compared with the hybrid populations, they were shorter with less branches. The F_1 and F_3 'TTB'x'KDN' plants initiated flowers at the same time as 'TTB' which was two weeks later than 'KDN'. However, the F_3 line of 'KDN'x'TTB' initiated flowers at the same time as 'KDN' indicating a new day neutral line (Figure 4). Hybrid vigor can be obtained from specific controlled crosses in sorrel.

Conclusion

Hybrid vigor can be obtained from controlled crosses between 'TTB' and 'KDN' in the F_1 population for plant height and branching. Through selection of the F_2 population, F_3 populations can be obtained that maintain the vigorous growth and branching characteristics. The early flowering characteristic of 'KDN' was recovered in a third generation from the 'KDN'x'TTB' hybrid. The day neutral characteristic can be recovered in the F_3 population when 'KDN' is the female parent in the initial hybrid.

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KDN



TTB

Figure 1. Fruit of sorrel parents indicating calyx fruit characteristics.

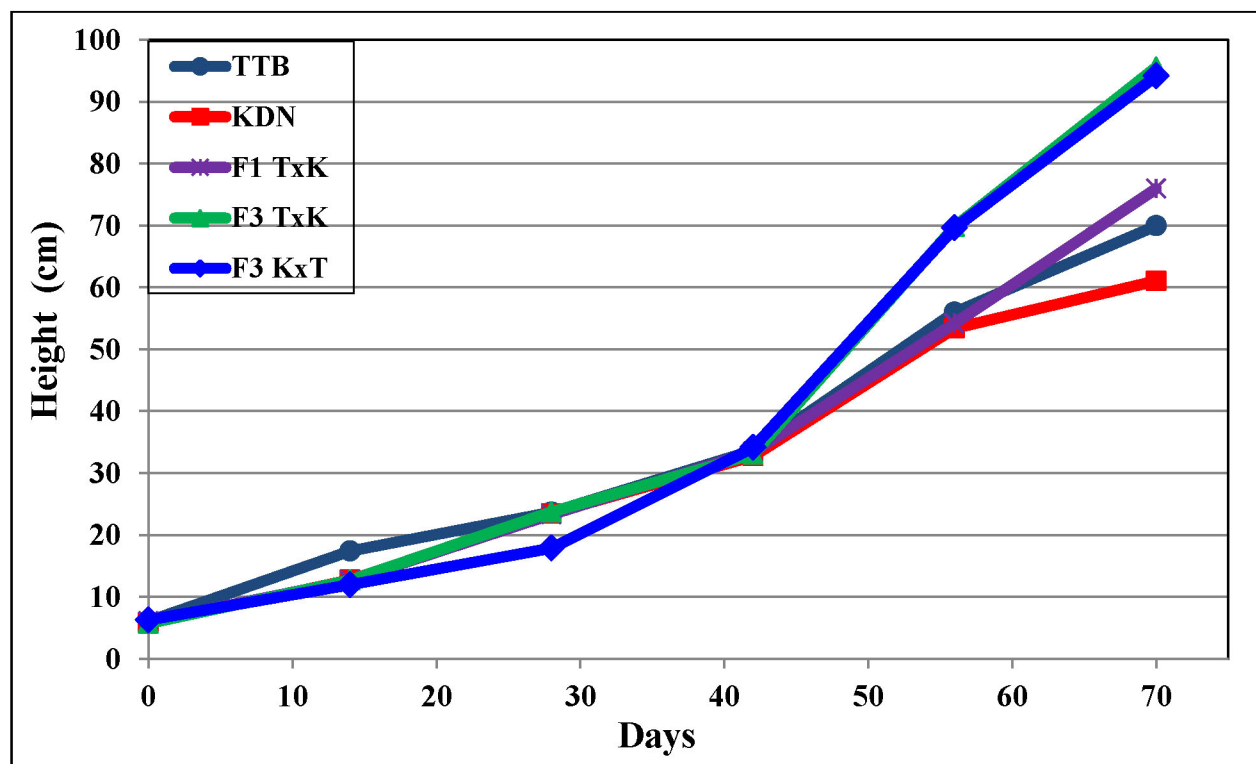


Figure 2. Height of the parents, F₃ hybrids and F₁ hybrid over time.

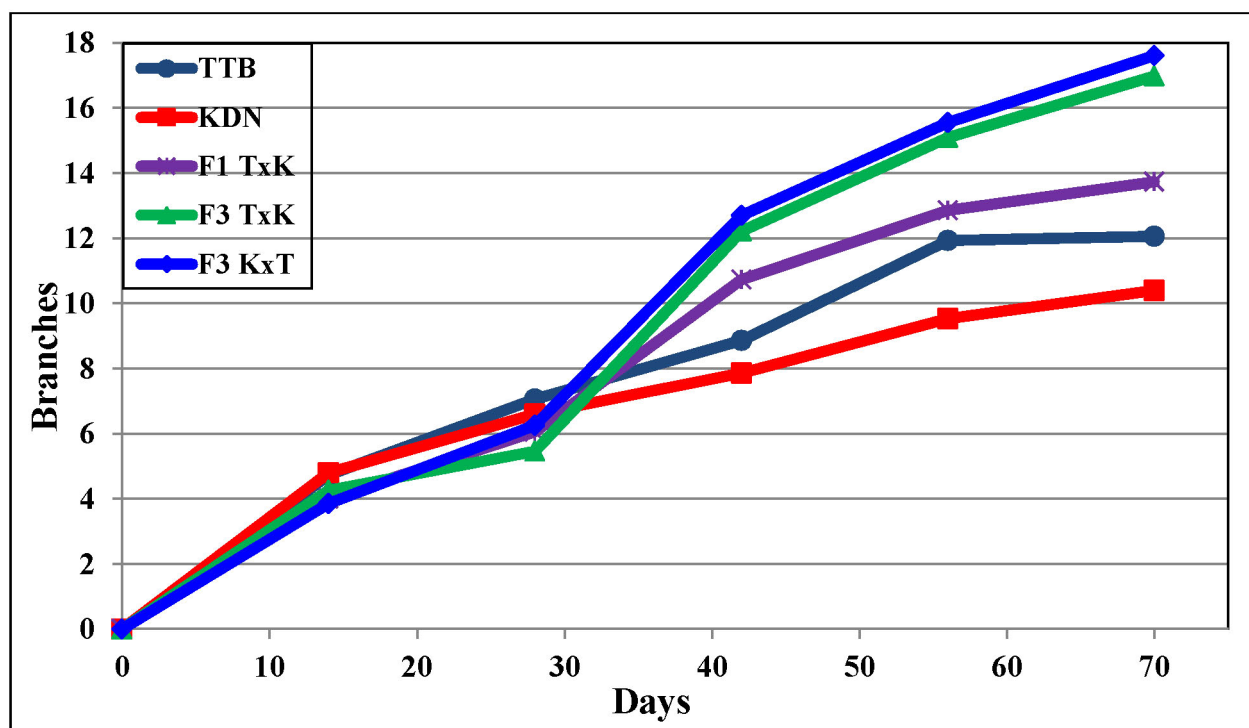


Figure 3. Number of branches of the parents, F₃ hybrids and F₁ hybrid over time.

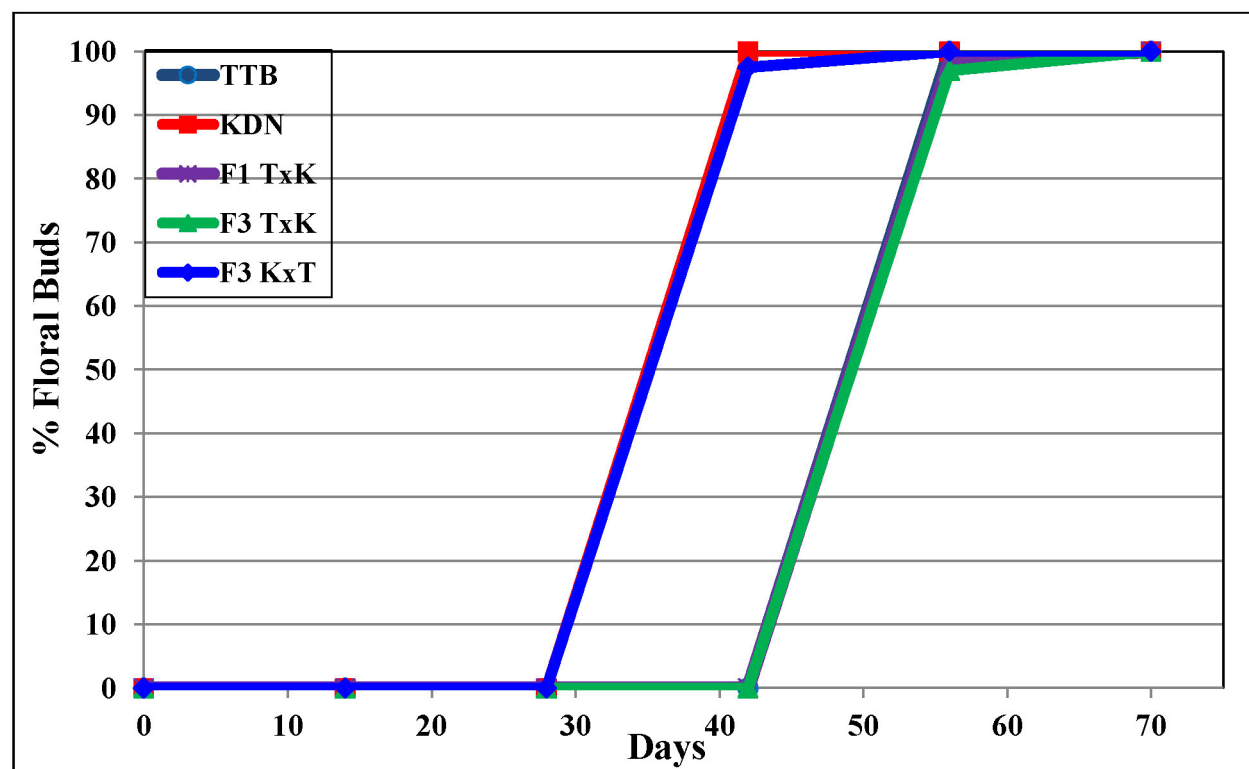


Figure 4. Initiation of flowers by the parents, F₃ hybrids and F₁ hybrid over time.