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EFFECT OF TRANSPLANT TIMING AND TERMINAL BUD REMOVAL ON SORREL

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ABSTRACT

A greenhouse experiment was conducted to determine the effects of transplant timing and terminal bud removal on the growth and development of sorrel (Hibiscus sabdariffa). Sorrel seedlings were transplanted 30, 45 and 60 days after germination and terminal buds removed 15 and 30 days after transplanting. Removal of terminal buds reduced plant height as well as the number of branches per plant. However, removing terminal buds 15 days after transplanting had a more severe effect on branching of sorrel plants than terminal bud removal 30 days after transplanting. Time of transplanting or terminal bud removal did not affect chlorophyll or xanthophyll content of sorrel. Stem diameter was significantly affected by both time of transplanting and terminal bud removal. Stem diameter ranged from 1.6 cm for plants transplanted 60 days after germination to 2.4 cm for sorrel transplanted 30 days after germination. Sorrel yield also followed a similar pattern. Dry weight of sorrel calyx was 4.6 grams per plant for 60-day transplants with terminal buds removed 30 days after transplanting to a high of 49.7 grams per plant for 30-day transplants with terminal buds removed 15 days after transplanting.

INTRODUCTION

Sorrel or roselle (Hibiscus sabdariffa) is a multipurpose tropical crop which is mainly grown for its edible fruits in the West Indies. Although this crop is used mainly as a beverage in the Caribbean, in certain parts of Africa the leaves are used as a vegetable. In addition, the stem is used as a source of fiber (JAS, 1962; Adamson et al., 1979; Banghoo et al., 1986; USDA, 1907).

To date, there has been limited research on sorrel and its uses which restricts it to speciality crop status. Research on this crop at Tuskegee University began four years ago and production practices are being evaluated. Also, the Food Science Department at Tuskegee University is currently evaluating the foliage as a source of green vegetable.

Sorrel seeds are usually sown during the long-day-length periods and set flowers only during short days. When grown for fiber, plants are drilled in 12-18" rows. However, when grown for fruits and not fiber, a wide spacing is allowed (usually 1m x 1m) to encourage branching.

It is generally observed that terminal bud removal result in an increased production of lateral branches. This apical dominance is attributed to either nutrient distribution or hormonal control. Hormonal control is effected through auxin; its distribution in lateral buds or its impact on cytokinin is noted in elongation (Phillip, 1975). In studying apical dominance on sweet pea (Lathyrus adoratus), Ross (1986) noted the antagonistic effects between auxin and cytokinin. He further attributed lateral bud growth restrictions to genetic factors favorable to increased internode length.

Kathiravetpillia and Kulasegaram (1982) also noted an increase in branching with the removal of terminal buds. They further stressed the importance of time of debudding and the effect on branching pattern. They observed that early debudding resulted in the production of branches low on the stem with long primary shoots. On the other hand, late bud removal produced a higher branching pattern with an increased root:stem ratio. Therefore, the purpose of this experiment was to determine the effects of terminal bud removal and date of transplanting on growth and yield of sorrel.

MATERIALS AND METHODS

This experiment was conducted at the George Washington Carver Agricultural Experiment Station, Tuskegee University, Alabama from July 1989 to February 1990. Sorrel was planted in a complete randomized design with factorial arrangement of treatments with three replications. For the experiment, plants were transplanted at 30, 45, and 60 days after germination and the terminal bud of each transplant was either left intact, removed at 15 days or 30 days after transplanting.

Before planting, seeds were immersed in a 10% clorox solution for 15 minutes followed by a 15-minute rinse under tap water then sown in 5 x 5 x 8 cm germinating trays. Five days after germination, seedlings were watered with a nutrient solution of 1 tablespoonful (20-20-20) fertilizer per gallon of water. Seedlings were transplanted into 23 cm diameter polyethylene pots containing a 3:1 mixture of soil (Norfolk sandy loam) and peatmoss. Each plant received 600 mL of the nutrient solution per week. This rate was increased to 2 tablespoonsful (20-20-20) per gallon of water at anthesis. A weekly spraying program was followed, using malathion to reduce the incidence of insects in the greenhouse. Data collected were plant height, branches per plant, fruit fresh weight, fruit dry weight and stem diameter.

RESULTS AND DISCUSSION

Effects of transplant date and terminal bud removal on plant height are presented in Figures 1, 2 and 3 and Table 1. Both transplant date and terminal bud removal significantly

reduced plant height. Whether terminal bud was left intact, removed 15 or 30 days after transplanting, there was a significant linear relationship between plant height and age. However, immediately following terminal bud removal there was a prolonged period of recovery. Plants transplanted 45 days after germination and had terminal buds removed 15 days after transplanting, recovered much slower than plants that had their terminal buds removed at a later date (Fig. 1). However, late transplanting reduced plant height to the point where no difference was detected among plant with terminal buds removed. Stem diameter, as with plant height, was significantly affected by transplanting date but not terminal bud removal (Table 1).

The effects of different planting dates and terminal bud removal on the branching of sorrel is shown in Fig 4. Not removing terminal bud resulted in an increased number of branching of sorrel. This increased branching was also due to the earliness of transplanting sorrel seedlings. The earlier seedlings were transplanted or their terminal buds not removed, the greater the number of branching. Table 2 shows some production characteristics of sorrel. While calyx yield does not show a particular trend, it holds true that when sorrel is transplanted early, yield also increased. However, transplanting later resulted in a higher percent dry weight of sorrel calyx.

CONCLUSION

The purpose of this experiment was to determine the effects of terminal bud removal and date of transplanting on the growth and development of sorrel. This experiment has shown that if sorrel plants are left intact, there will be no reduction in branching. However, for a shorter more compact plant, removing terminal bud early will not significantly reduce yield. It should be noted that the increasing importance of speciality crops in the US emphasizes the need for more effort and research on the production and utilization of sorrel. Relatively few researchers or institutions internationally are involved in sorrel research. As a start, research at Tuskegee University is addressing some of these problems.

Table 1. The effects of transplanting date and terminal bud removal on plant height and stem diameter of sorrel

Treatment**	Plant height	Stem diameter
	cm	
A1	91.6^{a*}	2.40^{a}
2	74.1^{c}	2.37^{ab}
3	70.5^{c}	2.37^{ab}
B1	81.4^{b}	2.07^{bc}
2	61.6^{de}	2.03^{c}
3	59.5^{e}	1.97^{c}
C1	64.7^{d}	1.87^{cd}
2	61.3^{de}	1.83^{cd}
3	61.3^{de}	1.63^{d}

*Means followed by the same letter within a column do not differ significantly at the 5% probability level using Duncans Multiple Range Test.

**A,B,C Seedling transplanted 30, 45 and 60 days after germination, respectively

**1,2,3 No terminal bud removed, terminal bud removed 15 days after transplanting and terminal bud removed 30 days after transplanting, respectively.

Table 2. The effects of transplanting date and terminal bud removal on some production characteristics of sorrel

Treatment*	Fresh Calyx Yield (gm/plant)	Calyx % of total (%)	dry weight (%)
A1	20.7	57.1	10.9
2	49.7	55.1	10.9
3	14.9	49.8	12.8
B1	27.1	51.3	12.7
2	16.9	59.3	11.2
3	10.0	51.6	11.5
C1	28.7	50.1	14.9
2	25.7	45.3	15.0
3	4.6	42.4	13.5
LSD.05	32.0	8.41	3.27

*A,B,C Seedling transplanted 30, 45 and 60 days after germination, respectively.

*1,2,3 No terminal bud removed, terminal bud removed 15 days after transplanting terminal bud removed 30 days after transplanting, respectively.

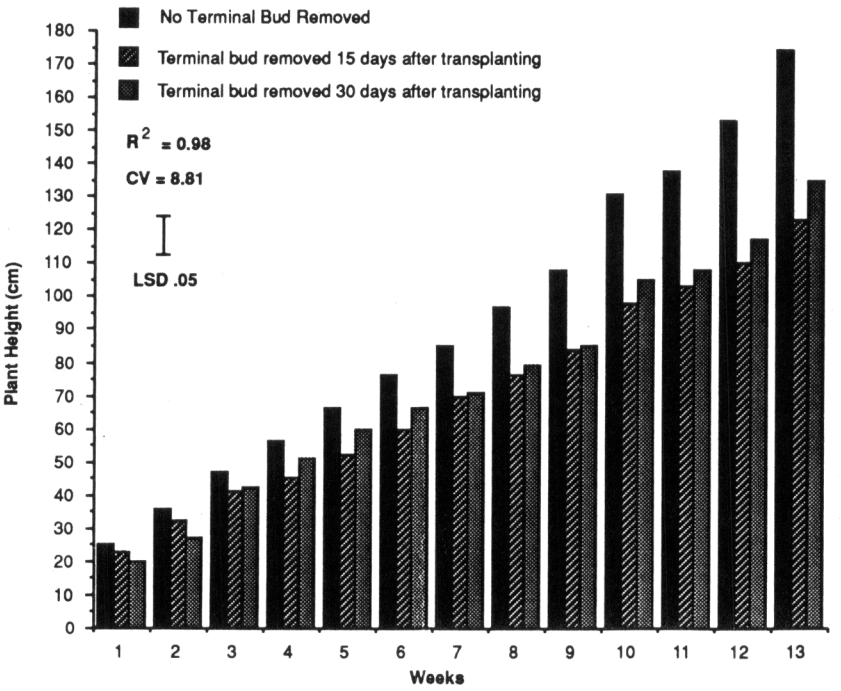

Fig. 1. Influence of terminal bud removal on plant height of sorrel transplanted 30 days after germination.

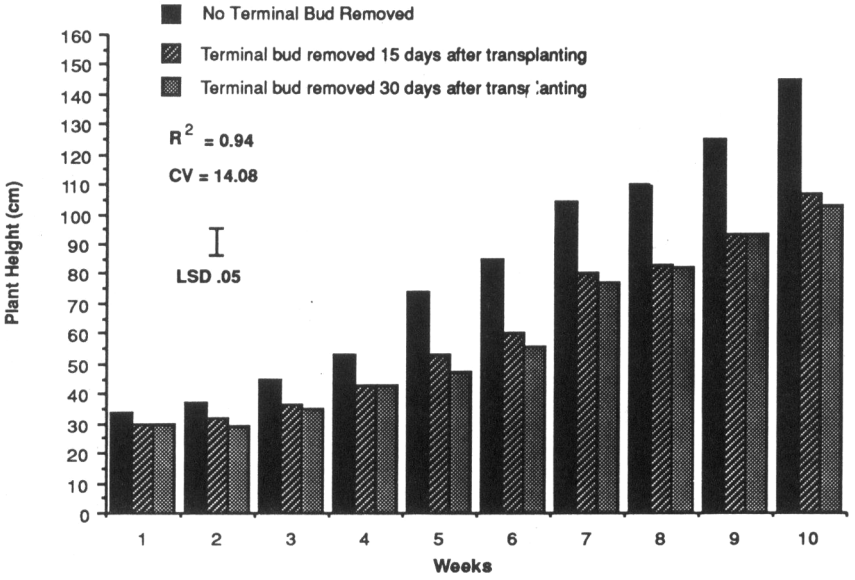

Fig. 2. Influence of terminal bud removal on plant height of sorrel transplanted 45 days after germination.

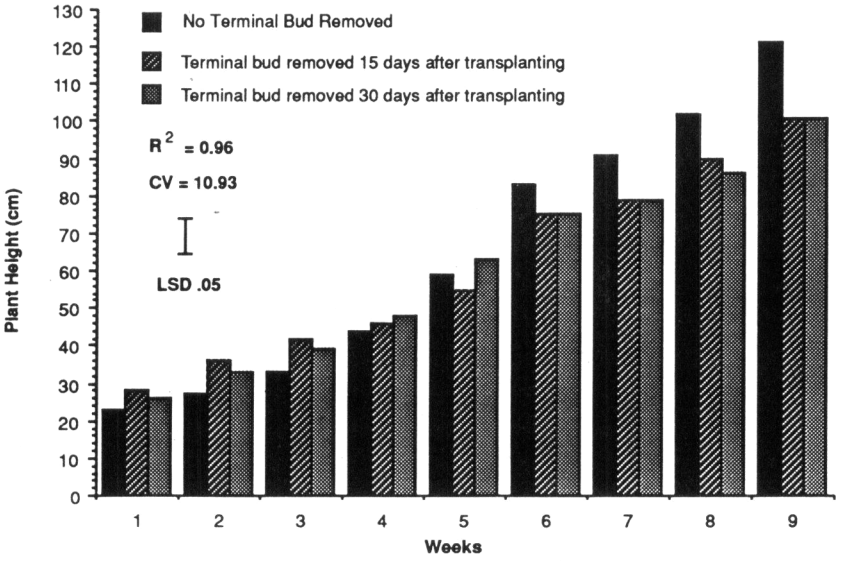

Fig. 3. Influence of terminal bud removal on plant height of sorrel transplanted 60 days after germination.

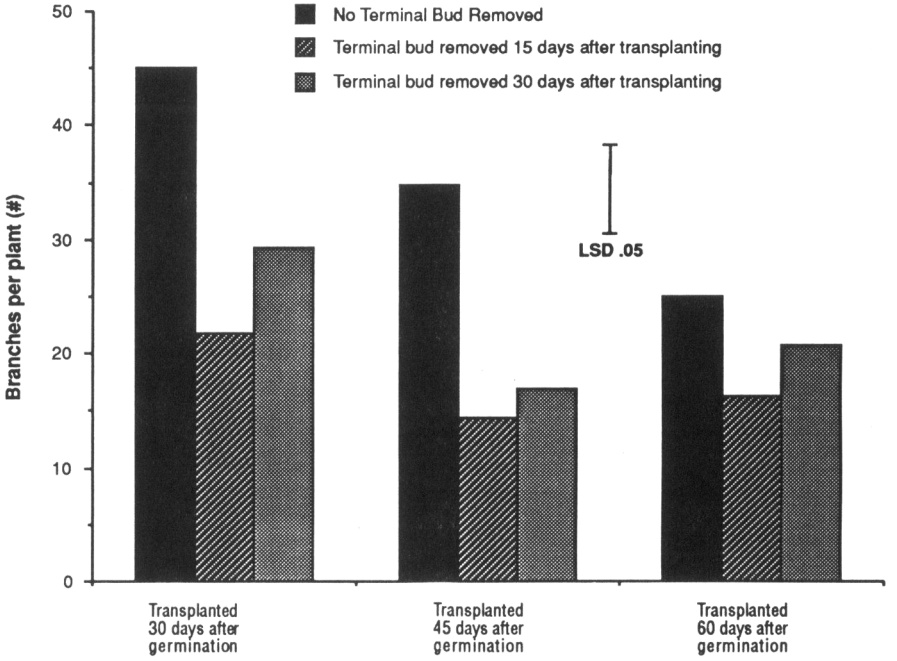

Fig. 4. Effect of transplanting date and terminal bud removal on branching of sorrel.

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