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EFFECTS OF STAGE OF DESUCKERING ON GROWTH CHARACTERISTICS OF BANANA CLONE WILLIAMS W-193/3

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Abstract: The research was conducted at the field of Horticultural Research station at Shambat, Sudan for three consecutive seasons to determine the effects of desuckering stage, on growth characteristics of banana clone W-193/3. The experimental material was planted at spacing of 2.5 x 2.5 m in 5×5 m plots. The treatments were maintaining two suckers per stool and extra suckers removed by digging at heights of 150, 200, 300, 400 and 1000 mm. Growth parameters recorded were plant height, pseudostem girth at harvesting, number of leaves and days to shooting through three crop cycles. The results indicated that plant height, pseudostem girth and total number of functional leaves were increased significantly ($p<0.5$) by desuckering at 150 and 200 mm. The shortest days from planting to shooting and from shooting to harvesting were obtained when desuckering was done at 150mm and 200mm length of suckers. These results demonstrated the importance of desuckering in the management of banana plantations. Early desuckering (150mm and 200 mm) gave better results than delayed desuckering at 300, 400 and1000 mm
Keywords: banana, Williams, W-193/3 clone, desuckering.

Introduction

A number of suckers from the underground stem are produced during the life cycle of banana resulting in intra-mat competition through creation of multiple sinks and intensification of root and rhizome competition for space, water and nutrients. Therefore, growth of excess suckers should be discouraged before they become too large and unmanageable to interfere with growth of the parent plant and followers resulting in extended crop cycle and reduced yield of ratoon crop (Stover and Simmonds, 1987; Donald and Low, 1990; Seifu, 2003). Therefore, banana desuckering describes the practice of removing unwanted (or surplus) suckers which develop from a rhizome of a banana plant (Simmonds, 1966; Robinson, 1995).Pruning technique is one of the most critical operations and controversial issue in banana production and plantation management with enquiries such as; when and how to be done and number of followers to be maintained with the main plant (Acland, 1980).

Frequency of desuckering varies widely according to climate and labor costs. In the humid tropics, excess suckers are removed every 4 to 6 weeks throughout the year, due to the

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continuous warm condition. In the subtropics of South Africa, however, the average increment in height of young 'Williams' ratoon suckers is about 150 mm month^{-1} in summer and only 10 mm month^{-1} in winter. Accordingly, monthly desuckering is thus recommended in summer but is unnecessary during winter where the suckers were still in the thin bract-like structures. Taller suckers with board leave rapidly become competitive with the selected followers. The operation is done only twice a year in Australia due to prohibitive labor costs (Robinson and Nel, 1990).

With Cavendish subgroup bananas, Robinson and Nel (1990) determined experimentally that by allowing all excess suckers in a 'Williams' plantation to reach a height of 500 or 800 mm before removal, the average yield per annum after three cycles was decreased by 7.6 and 15.6% respectively, compared with the recommended 300 mm desuckering. The height of suckers to be removed had a direct effect on bunch size as a result of inter- and intra-mat competition (Robinson, 1995). Stover and Simmonds (1987) reported intensification of intra-mat competition when two or more suckers were allowed to develop and mature through establishment of multiple roots and rhizome competition for space, water and nutrients. They also found that bunch weight was decreased and harvest time was increased by 3 weeks, when two suckers were left on a stool.

Although banana is very important fruit crop in Sudan, yet, scanty efforts were exerted to explore the effect of number of suckers with mother plants on growth and yield of Dwarf Cavendish banana cultivar (Hammad, 1980; Dawoud, 1989; Al-amin, 1993). However, no research work was carried out to investigate the effect of height of unwanted suckers on growth of different banana cultivars. Therefore, there is a great need to increase production to meet the rising demand of banana through improvement of the present standards of husbandry practices since; the farmers lack the correct scientific knowledge of desuckering. The present study was carried out to determine the optimum height of unwanted sucker to prevent competition and the effect of desuckering on growth and yield and to establish the optimum stage of desuckering in order to achieve high yield and good vegetative growth of banana clone W-193/3.

Materials and Methods

The experiment was conducted for three consecutive cropping season sat Shambat Agricultural Research Field Station (15º 39´N; 32º 39´E). The experiment was laid out in a randomised complete block design with three replications. A clone Giant Cavendish Williams

W-193/3 was planted in a spacing of 2.5 m x 2.5 m between plants and rows.Initially, the banana stool consisted of the mother plant and one sucker or follower (daughter) that was allowed to grow after 2 months from planting the plant crop. After harvesting the mother plant, the sucker took the lead and became the mother plant in the next generation. Only two daughter suckers per stool were maintained and the extra suckers were removed at heights of 150 mm (T1), 200 mm (T2), 300 mm (T3), 400 mm (T4) and 1000 mm (T5). The data were collected on plant height which was measured at a distance at 5 cm from the base to the point of junction of the upper two youngest leaves, using tape meter. The diameter (girth) of pseudo stem was measured at 5 cm above soil surface level using tape meter. Number of leaves produced was counted. The last counted leaves were marked with a permanent label to facilitate counting. Data collected during the three cycles at flowering. Inflorescence emergence was recorded as time lag (days) between planting and inflorescence emergence (shooting) for three cycles of banana growth. The age of the bunch (days) was determined from the time of emergence of inflorescences to the time of harvesting.

The computer Mstatc program was used for statistical analysis for the collected data. The data was analyzed corresponding to the randomized complete block design.

Results and Discussion

Vegetative growth

The effect of sucker removal on banana plant height is illustrated in Figure 1. The data revealed that desuckering at 150 and 200 mm significantly increased plant height, whereas, desuckering at 1000mm resulted in the lowest values of plant height of banana clone W-193/3. The three growth cycles of banana growth showed similar trend. In this respect, Odeke, (2007) reported that delaying desuckering up to 1000 mm height enhanced intra-mat competition. This was probably attributed to the competition between the surplus suckers and the mother plant for nutrient and water (Stover and Simmonds, 1987; Robinson and Nel, 1990).

Banana pseudostem diameters (girth) of the plant crop, first ratoon and second ratoon were appreciably increased with removal of unwanted sucker at 150 and 200mm (Figure 2). As in plant height, the diameter was significantly reduced by delaying desuckeringof excess suckers to 300 mm, 400 mm and 1000 mm. These results might be explained and supported by the fact that growth in circumference of the pseudostem is closely related to the number of

leaves, since the pseudostem consists of overlapping leaf sheaths, and the latter were reduced by intra-mat competition (Stover, 1979).

The influence of desuckering treatments on the number of functional leaves of the plant crop, first ratoon and second ratoon is illustrated in Figure 3. The number of functional leaves was increased significantly with desuckering at150 and 200 mm followed by 300 and 400mm. Desuckering of unwanted suckers at1000mm height gave the lowest number of leaves. These results were in line with Chandler (1958) who pointed out that the stage of desuckering was of vital importance to ensure good growth. Similar results were reported by Robinson and Nel (1988). Delaying desuckering up to 1000 mm height enhanced intra-mat competition (Stover and Simmonds, 1987; Robinson and Nel 1990).

Crop cycle duration

Significant differences were detected between treatments in number of days from planting to shooting and from shooting to harvesting (Table 1). Days from planting to shooting and from shooting to harvesting were fewer when suckers were removed at 150 and 200mm. This was probably owed to the sufficient nutrient available for the formation of the inflorescences which enhanced the plant to flower early (Govea, 1989). The highest number of days in the three cycles were associated with desuckering at 1000mm. Plants might compete for assimilates, moisture and nutrients, which resulted in extended cycle (Stover and Simmonds 1987).

Conclusions

The results of the study have demonstrated the importance of desuckering in the management of banana plantations. Plant growth and cycle duration were significantly influenced by stage of desuckering. Plants that were desuckered at 150 and 200 mm (early desuckering) consistently gave better results than those which were desuckered at 1000 mm (delayed de-suckering), suggesting the need to practice early desuckering.

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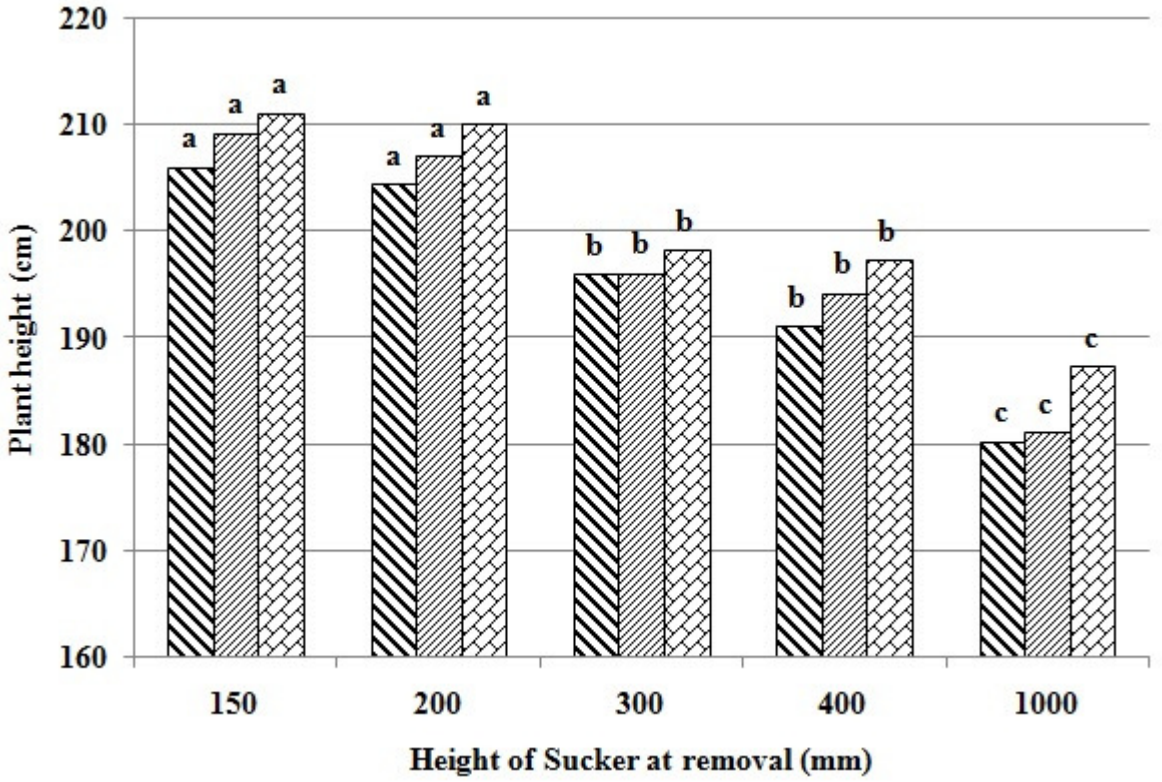

Figure 1. Effect of desuckering stage on height of banana main crop (▨), first (▨) and second (▨) ratoon crop.

Similar letters on similar columns indicate no significance difference a at 5% level according to Duncan's Multiple Range Test.

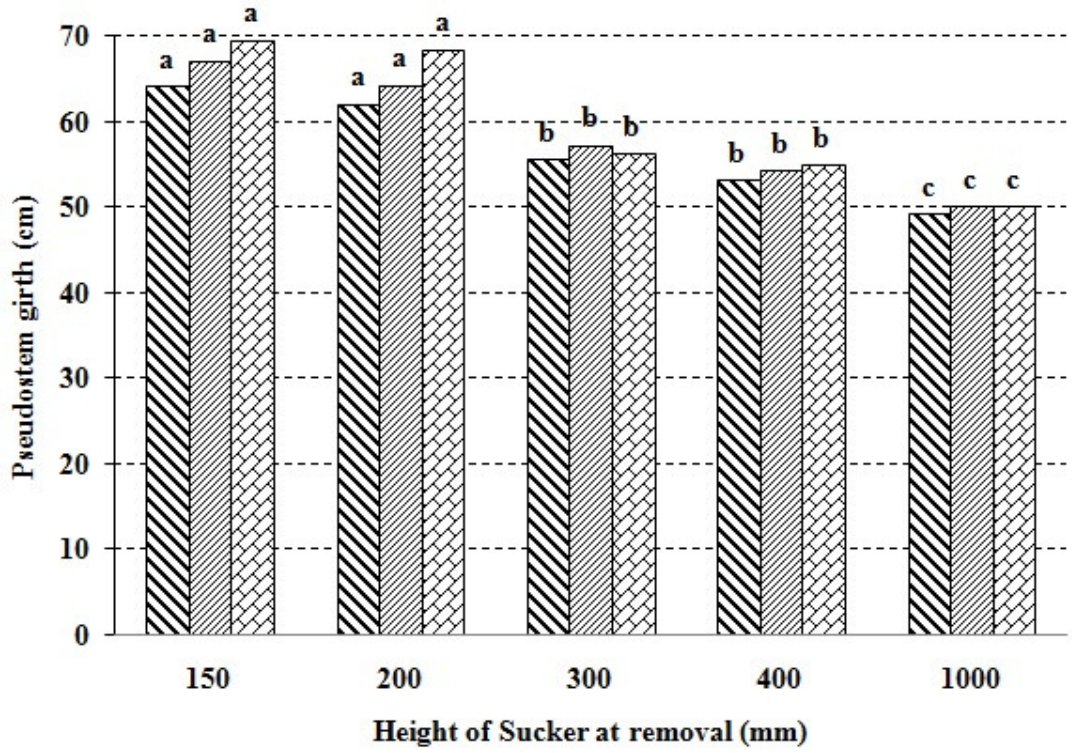

Figure 2. Effect of desuckering stage on pseudostem girth of banana main crop (▨), first (▨) and second (▨) ratoon crop.
Similar letters on similar columns indicate no significance difference a at 5% level according to Duncan's Multiple Range Test.

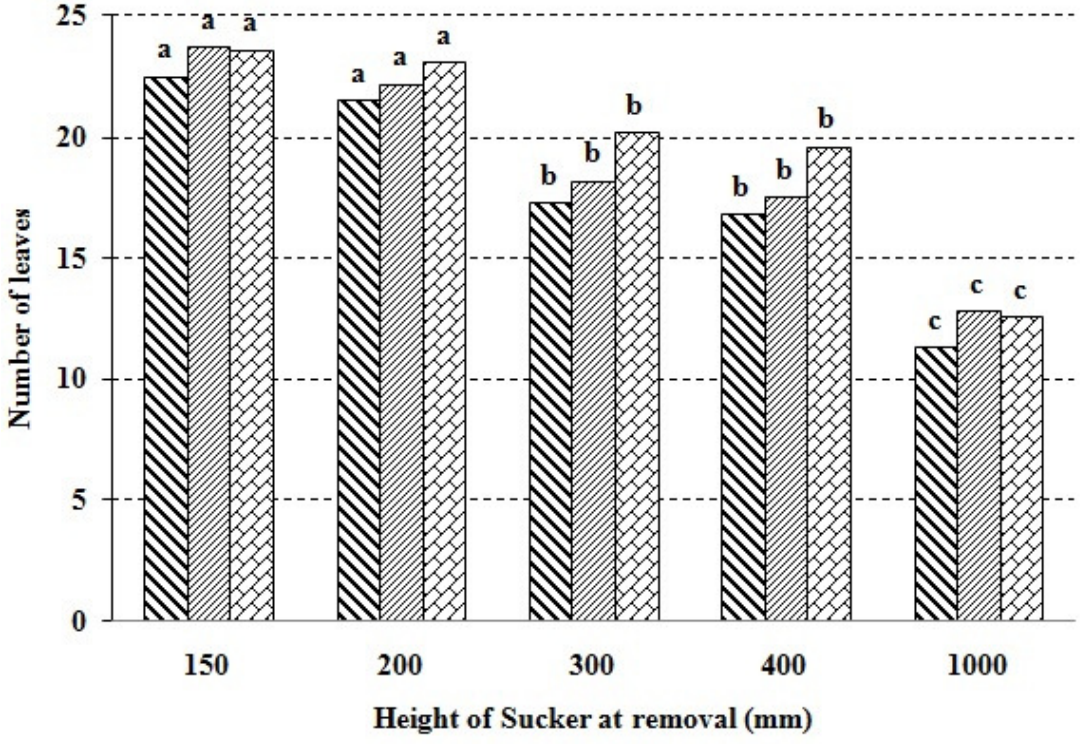

Figure 3. Effect of desuckering stage on number of leaves of banana main crop (▨), first (▨) and second (▨) ratoon crop.

Similar letters on similar columns indicate no significance difference a at 5% level according to Duncan's Multiple Range Test.

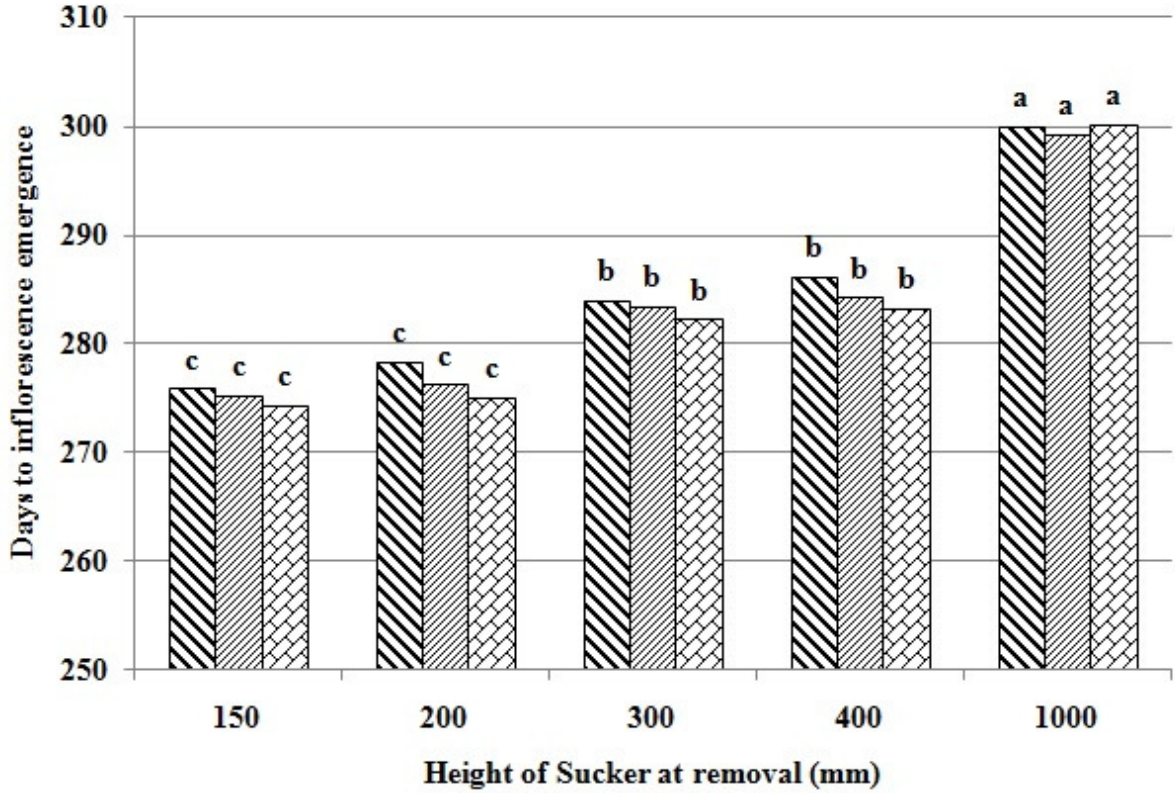

Figure 4. Effect of desuckering stage on time to shootingof banana main crop (▨), first (▨) and second (▨) ratoon crop.
Similar letters on similar columns indicate no significance difference a at 5% level according to Duncan's Multiple Range Test.

Table 1. Effect of desuckering on crop cycle duration of banana clone W-193/3 of the main crop, first and second ratoon

Height of sucker removal	Days from planting to shooting			Days from shooting to harvesting		
	plant crop	1st ratoon	2nd ratoon	plant crop	1st ratoon	2nd ratoon
150 mm	275.9^{c}	275.3^{c}	274.4^{c}	75.9^{c}	72.7^{d}	71.6^{c}
200 mm	278.4^{c}	276.3^{c}	275.1^{c}	77.6^{c}	75.4^{c}	73.7^{c}
300 mm	284.0^{b}	283.5^{b}	282.3^{b}	83.3^{b}	81.7^{b}	80.2^{b}
400 mm	286.2^{b}	284.3^{b}	283.3^{b}	85.6^{b}	82.7^{b}	80.6^{b}
1000 mm	300.0^{a}	299.3^{a}	300.2^{a}	95.5^{a}	92.8^{a}	90.6^{a}

Similar letters within column indicates no significant differences at 5% level according to Duncan’s Multiple Range Test.