# EFFECTS OF PLANT SPACING AND REMOVAL OF SHOOT TIPS AND FLOWERSON GROWTH AND YIELD OF SPIDER PLANT *(Cleome gynandra* L.) IN KENYA

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**DECLARATION**

This thesis is my original work and has not been presented for a degree in any other university.

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**APPROVAL**

This thesis has been submitted for examination with our approval as university supervisors.

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**ABSTRACT**

Spider plant (*Cleome gynandra*) is one of many African leafy vegetables (ALVs) which has experienced a resurgence of promotion and research interest in recent years, leading to increased consumer demand. However, research focused on improved agronomic practices for spider plant and profitability of small-scale commercial production has been minimal, creating a gap between production levels and consumer demand for this vegetable. Therefore, this study seeks to contribute to developing best agronomic practices for spider plant by determining its response to plant spacing and crop management practices (i.e. shoot tip and flower removal), and by evaluating the feasibility of commercial production through a gross margin analysis. Two field experiments were conducted at the Upper Kabete Field Station of the University of Nairobi, Kenya, during the long rains (February-May) and in the dry season (June-August) 2014 using a commercial spider plant genotype. The two experimental factors were plant spacing (30x15 cm - recommended, 30x20 cm and 20x15 cm) and management practices (shoot tip removal at6 weeks after planting and flower removal at flower bud formation). These were laid out as a 3 x 3 factorial experiment in a randomized complete block design and replicated three times with a control. Seeds were planted in raised beds with cow manure as nutrient input (50 kg N $ha^{-1}$) and supplemental irrigation applied when necessary. Results showed that plant spacing significantly ($p \leq 0.05$) affected the number of leaves and shoots, leaf yield, and fresh and dry shoot weight. Plants with wide spacing (30 x 20 cm) had an average of 23 leaves per plant which was significantly ($p \leq 0.05$) higher than that of the recommended spacing (30x15cm) with 19 leaves per plant and the narrowest spacing (20x15cm) with 18 leaves per plant. The same trend occurred for the number of shoots: the wide spacing produced 10 shoots per plant, compared to 8 shoots for both the recommended and narrow spacing. For total leaf yield, the wide spacing produced 51 g $plant^{-1}$ that was significantly higher than the narrow spacing with 38 g $plant^{-1}$. When the fresh shoot

weight was calculated per unit area, the wide spacing yielded significantly lower fresh shoot weight at 14.2 t $ha^{-1}$ compared to the recommended spacing at 19.2 t $ha^{-1}$ and narrow spacing at 18.4 t $ha^{-1}$. Similarly, dry shoot weight yielded significantly more for the narrow spacing (2.5 t $ha^{-1}$) than both the recommended and wide spacing, each with 2.0 t $ha^{-1}$of dry shoot weight. For management practices, flower removal produced significantly ($p \leq 0.05$) greater plant height, leaf yield, and fresh and dry shoot weight than both shoot tip removal and the control, neither of which were significantly different from each other. Flower removal resulted in plants with a height of 66 cm, compared to 48 and 49 cm for shoot tip removal and the control, respectively. The number of leaves per plant was significantly greater with flower removal (35 leaves) as compared to the control with 24 leaves. For total leaf yield, flower removal produced 12.3 t $ha^{-1}$, which was significantly greater than both shoot tip removal (8.4 t $ha^{-1}$) and the control (6.5 t $ha^{-1}$). Treatment interactions occurred only for fresh shoot weight during trial2, where the narrow spacing with flower removal yielded 14.2t $ha^{-1}$, which was significantly ($p \leq 0.05$) greater than five other treatments, and more than double the lowest yielding treatment of wide spacing combined with no shoot or flower removal (6.0 t $ha^{-1}$). The gross margin analysis demonstrated that when utilizing the narrow spacing and flower removal, production of spider plant could generate between 361,000-530,000 Ksh per acre for one season depending on the source of labour and other variable costs. This study concluded that both plant spacing and management practices significantly affect the growth and yield of spider plant with flower removal giving the highest performance, along with narrow spacing when grown for yield per unit area. Based on these findings, it is recommended that when planted in raised beds with adequate nutrients and moisture, spider plant should be grown at a spacing of 20 x 15 cm and that flower removal should be practiced to increase yield.