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ROOT AND SHOOT GROWTH OF *DRACAENA FRAGRANS* 'MASSANGEANA': CORRELATIONS WITH CANE CIRCUMFERENCE

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ABSTRACT

Root and shoot development of *Dracaena fragrans* 'Massangeana' was determined 51, 72, 93, and 114 days after fresh cut cane was planted. Basal circumference of canes varied from 13.5 to 19.5cm. At each sampling date, root: shoot ratio was affected by cane circumference. As cane circumference increased above 14.5cm, root length and root:shoot ratio decreased. Number of developing shoots was not affected by cane circumference at any sampling date. Leaf area was not affected until sampling day 114, when it increased as circumference increased.

RESUMEN

Se evaluaron los efectos de seis tratamientos sobre el desarrollo radicular en cañas de *Dracaena fragrans* "Massangeana". Los tratamientos fueron: (a) anillado a 12cm. de la base de la caña, (b) anillados a 6 y 12cm. de la base de la caña, (c) muescado usando un grupo de tres pequenos incisiones horizontales a 12cm. de la base de la cana, (d) muescado unsando dos grupos de tres pequenos incisiones horizontales a 6 y 12cm. de las base de la caña, (e) cortes longitudinales utilizando tres incisiones de 12cm. de largo distribuidas cada 120° alrededor de la caña y, (f) control. Aunque el desarrollo radicular fue afectado por los diferentes tratamientos, la circunferencia de las cañas también ejerció una fuerte influencia. Las cañas con las mayores y menores circunferencias desarrollaron un sistema radicular menos extenso que aquellas de tamaño medio, mientras que el óptimo desarrollo foliar ocurrió en aquellas cañas de circunferencia mayor.

Additional index words: Leaf area; Foliage plant.

Dracaena fragrans 'Massangeana' is a popular foliage plant in interiorscapes. When propagated by canes, a number of buds (usually 1 to 3) develop near the apcial end, forming whorls of leaves, commonly called 'heads' by tropical foliage plant growers. Because of this growth habit, 'Massangeana' are usually potted using 3 or 4 canes of different lengths per container to produce a larger visual mass (Fig. 1). During shipping, 1 or more of the canes frequently loses its vertical alignment in the container and leans against the side of the container. This problem was suspected to occur due to poor anchorage provided by the root system (2).

When purchasing cane for propagation, some growers perfer large circumference cane because they believe it produces larger 'heads' and a more salable plant. However, no known study has evaluated the root and shoot development of *D. fragrans* 'Massangeana' cane over time.

This study presents observations on root and shoot development of *D. fragrans* 'Massangeana' canes as affected by cane circumference.

Materials and methods

One hundred and twenty, 65-cm long cane pieces of *D. fragrans* 'Massangeana' were brought from Jamaica to Gainseville, FL. Upon arrival, a 1-cm slice was removed from the cane base and the lower portion of the canes (20cm) were soaked overnight in water. The canes were treated as follows: (a) girdling at 12 cm above cane base, (b) girdling at 6 and 12cm above cane base, (c) notching with 1 set of 3, 1cm incisions 12cm above cane base, (d) notching with 2 sets of 3, 1cm incisions 6 and 12cm above cane base, (e) wounding with 3 longitudinal 12cm cuts distributed 120° apart on the cane, and (f) untreated check. Each treatment was replicated 5 times per each of 4 planned sample dates. After treatment, the cane bases were dipped for 10 minutes in a Benomyl (600 ppm) + Streptomycin (300 ppm) solution, planted in standard black plastic 2-gallon containers filled with Canadian peat moss and placed in a greenhouse under light levels of 260 μmols s^{-1} m^{-2} (2000 ft.c.) in completely randomized blocks. Media was watered to keep it moist until rooting occurred, then fertigated with 100 ppm N as needed to keep it mosit. The 100 ppm N fertilizer solution was prepared from a 20–20–20 N–P_2O5–K_2O fertilizer. Greehouse heating and venting controls were set at 18 °C night and 25 °C day. Thirty canes were sampled every 3 weeks for 12 weeks, starting at day 51 after planting. On the last sample, plants needed 2 more weeks to meet the specifications of the Florida Foliage Industry for finished *D. Fragrans* 'Massangeana' cane (3).

At each sample date, the following data were taken: root length, fresh weight, dry weight; 'head' (shoot) length, fresh weight, dry weight; total leaf area for each 'head' and cane circumference. 'Head' length was measured from point of origin on the cane to the tip of the longest leaf in the whorl. Cane circumference was determined at each sampling date by measuring cane 2.5cm above the base. 'Head' size for each plant was approximated by the following formula:

$$\text{'Head' size} = \frac{\text{total leaf area}}{\text{number of 'heads'}} \times \frac{\text{total 'head' length}}{\text{number of 'heads'}}$$

The root:shoot ratio was computed in terms of root length to leaf area (1). Treatment effects have been previously reported and showed notching and girdling resulted in best root development (4). Analysis of the data revealed cane circumference influenced root and shoot development.

Results and discussion

At day 51, 72, and 93, cane circumference affected root length (Table 1). At day 114, the effect of cane circumference on root length was no longer evident

Table 1: Levels of statistical probability on the effect of cane circumference on different growth parameters of *Dracaena fragrans* 'Massangeana' at different days after propagation.*

Sample Day	Root Length	Leaf Area	Number of Heads	Root: Shoot Ratio	Head Size
51	0.0001	0.1711	0.3485	0.0006	0.0840
72	0.0003	0.8597	0.4582	0.0016	0.6172
93	0.0005	0.0942	0.7816	0.0001	0.3984
114	0.4008	0.0001	0.5575	0.0064	0.0688

*Values obtained from SAS Stepwise Regression Procedure, single variate model response reported.

if a single variate model was used to analyze the data. However, the SAS stepwise regression procedure showed that if leaf area effects were removed, cane circumference affected root length at p = 0.0002. As cane circumference increased above 14.5cm, root length decreased (Fig. 2). The effect of cane circumference on leaf area was not evident until day 114 when leaf area increased as cane circumference increased (Table 1, Fig. 3). The number of 'heads' produced per cane was not affected by the circumference at any harvest date. At day 114, an increased head size was associated with increased cane circumference (p = 0.0688). These results support the opinion of many *D. fragrans* 'Massangeana' growers that larger circumference canes produce shoots with more and/or larger leaves. However, these plants may not be the best plants to ship when the root:shoot ratios are considered. At each sampling date, cane circumference affected root:shoot ratio (Table 1) with decreasing ratios as cane circumference increased (Fig. 3). A cane circumference of 15.28cm was predicted by the SAS response surface regression procedure for optimum root and shoot development at day 114.

The results indicate that larger circumference cane (>17.0cm) takes longer than a smaller circumference cane to develop a balanced root:shoot system. Thus, root anchorage of large circumference cane would be less than small circumference can and the probability of leaning cane occurring during shipping and subsequent handling would be greater for large circumference cane. Consequently, producers of *D. fragrans* 'Massangeana' cane should harvest or cut cane before the basal circumference exceeds 17–18cm. If large circumference cane is used, growers should allow a longer time period for rooting. Other alternatives growers could use include girdling or notching cane for a better distribution of the root system as previously reported (4). Leaning cane can also be avoided by using a styrofoam plug in the center of multiple cane plantings and wrapping the outside of the canes with shipping tape (2). As previously reported (5), root and shoot development of thin cane (<13.5cm) is poor.

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Fig. 1. Multiple cane plantings of D. fragrans 'Massangeana.'

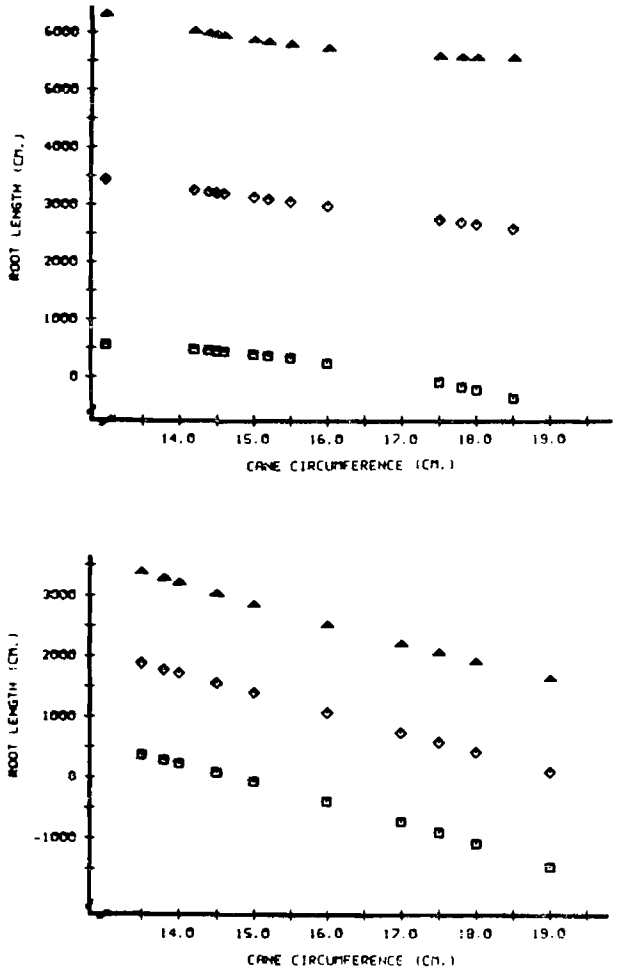

Fig. 2. Relationship between cane circumference and root length of D. fragrans 'Massangeana.' Upper graph day 114, lower graph day 93 after cut cane propagated. Data include all treatments.

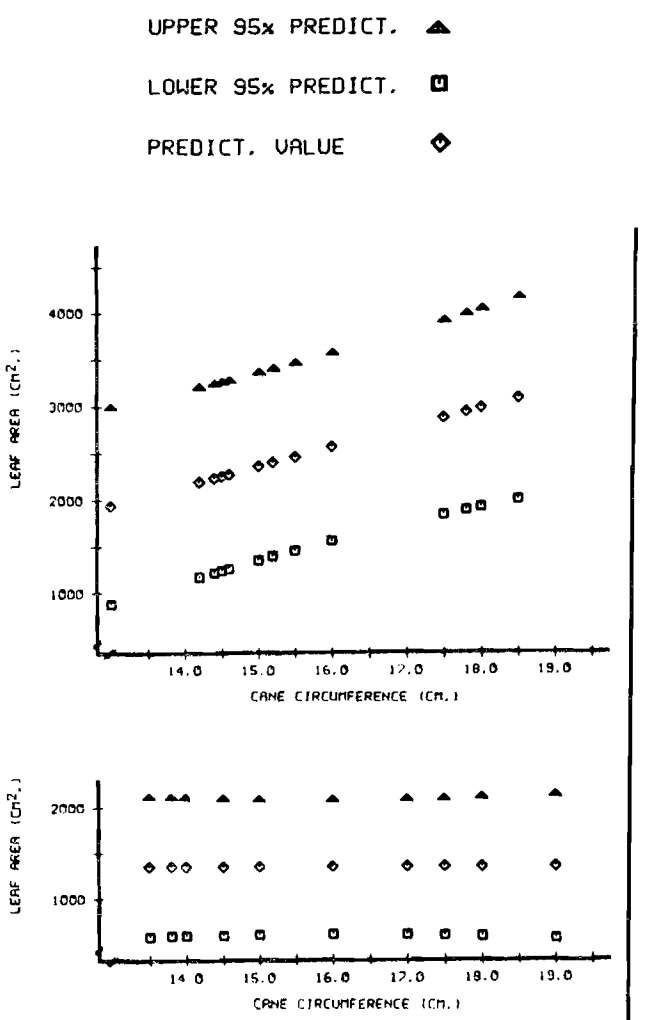

Fig. 3. Relationship between cane circumference and leaf area of D. fragrans 'Massangeana.' Upper graph day 114, lower graph day 93 after cut cane propagated. Data include all treatments.

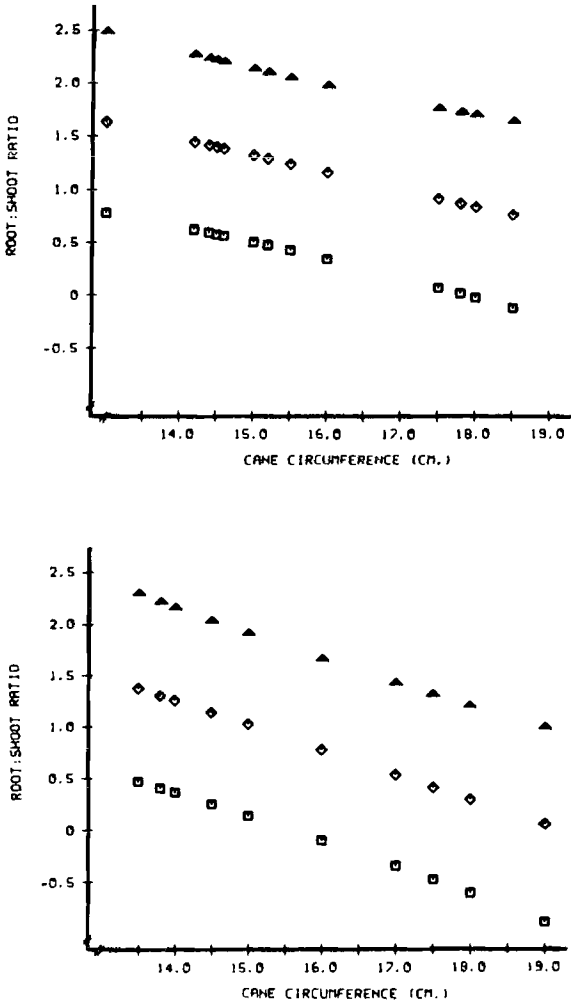

Fig. 4. Relationship between cane circumference and root:shoot ratio of D. fragrans 'Massangeana.' Upper graph day 114, lower graph day 93 after cut cane propagated.Data include all treatments.