

SHORT COMMUNICATION

EFFECT OF NUMBER OF LEAVES ON YIELD PERFORMANCES OF BANANA (VAR. EMBUL) UNDER HIGH DENSITY PLANTING SYSTEM

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INTRODUCTION

Banana (*Musa spp*) is one of the most popular fruit crops grown in Sri Lanka. The production of banana is year round and it could be profitably grown in all parts of the country except at higher elevations. Annual planting systems have been introduced by the Department of Agriculture to increase the income generated from the mother crop by three-fold in one cropping cycle (Weerasinghe, 2000). Recently there was an increasing interest for cultivation of banana as the Department of Agriculture has introduced the concept of cultivating banana for both leaves as well as for fruits (Weerasinghe *et al.*, 2008).

With the unexpected changes in weather, unpredictable high intensity rain fall coupled with extended dry periods (Sumathipala, 2010), the rainfed banana crop in Sri Lanka is subjected to water stress, which is the most critical factor during the fruit enlargement phase of the crop (De Costa, 2001). Reduction in leaf area of banana could reduce excessive evapotranspiration and alleviate water stress considerably during dry periods, which could be utilized by the plant for its fruit growth (Sirisena and Pinto, 1987). However, the number of effective leaves per plant may determine the performance of the crop. Therefore, the present study was carried out with the objective of studying the effect of number of leaves on the yield of Banana.

MATERIALS AND METHODS

The experiment was conducted at the research field of the Grain Legumes and Oil Seed Research and Development Center, Angunakolapelessa, Sri Lanka that belongs to DL_{1b} agro- climatic zone, and the soil type of the study area was Reddish Brown Earth (Punyawardhana, 2008). Conventional sward suckers of the banana (*Musa spp.*) var. Embul (AAB) were selected (45-50 kg in weight) and established in 45 cm x 45 cm x 45 cm pits with the spacing of 3 m x 1 m. Twenty plants per treatment were established in each plot. All plants were maintained under uniform conditions following the recommendations given under high density annual planting

system (Weerasinghe, 2000). Supplementary furrow irrigation was done at weekly intervals. The leaf pruning treatments were applied at the time of just after the male bud differentiation. Treatments were, control or no leaf removal (T₁), removal of all leaves (T₂), removal of older leaves and retain 5 youngest leaves (T₃), retain 10 youngest leaves (T₄), and retain 12 youngest leaves (T₅). The height at flowering, girth at flowering (30 cm above the base), time taken for harvesting maturity [harvesting maturity is a commercial stage (three-quarter round) with the fruit still having some angularity and being only 75% of its potential maximum size], finger length, finger girth, bunch weight and green life of fruits (the stage of finger between green color to trace of yellow) were evaluated. The treatments were arranged according to the Randomized Complete Block Design with 3 replicates. Data were statistically analyzed using ANOVA procedure using the SAS statistical software.

RESULTS AND DISCUSSION

Banana leaf takes 6-8 days to fully unroll from the tip and leaves emerging just before the inflorescence can live up to 150 days or more (Henry and Robert, 1998). Twenty five to 50 leaves emerge through the life cycle with 10-16 functional leaves present (total area 25 m²/leaf) at inflorescence emergence (Henry and Robert, 1998). At the time of imposing treatments in this experiment, the average number of leaves per plant was 16.

Table 1 shows a reduction in bunch weight, finger length, finger girth and weight of 10 fingers with the increasing number of leaves removed. However, when only 25% of leaves (12 leaves remained) removed, yield parameters increased significantly. Therefore, it is clear that bunch filling is not only a result of current net photosynthesis but also a combined effect of net photosynthesis, available assimilates for partitioning and food reserves in rhizomes (Sirisena and Pinto, 1987). There was no change in the time taken for harvesting maturity between treatments.

Table 1. Time taken for harvesting, bunch weight, length, girth and weight of fingers and green life of fingers at different leaf pruning levels

Treatments	Time taken for harvesting maturity (weeks)	Bunch weight (kg)	Finger length (cm)	Finger girth (cm)	Weight of 10 fingers (g)	Green life (days)
T ₁	13 a	15.9 b	11.2 b	10.2 b	71.8 c	4 a
T ₂	14 a	9.5 d	9.0 e	9.5 d	47.8 e	4 a
T ₃	14 a	11.2 c	11.0 d	10.0 c	64.2 b	3 a
T ₄	13 a	15.1 b	11.2 c	10.0 c	73.6 d	5 a
T ₅	13 a	16.6 a	13.5 a	12.5 a	95.1 a	5 a

Within each column, means followed by the same letter are not significantly different at $p=0.05$.

The amount of assimilates available for partitioning and translocation is determined by the rate of photosynthesis, which is in turn determined by the area of photosynthetic tissue (e.g. leaves, green stems and sometimes immature pods), the environmental conditions and demand for assimilates by the sink (De Costa, 2004). There was an enhanced leaf carbon dioxide exchange rate (CER) during the periods of heavy reproductive growth or when other leaves are removed either totally or partially (Gifford *et al.*, 1984). In this study partial leaf pruning was practiced at the time of reproductive growth when the demand for assimilates is higher. Henry and Robert (1998) reported that there was a 12 % reduction in bunch weight when leaf number was reduced from 10 to 4 while Turner (1994) and Robinson (1996) showed that when only four leaves were retained at flowering, bunch mass was reduced to a greater extent due to poor filling.

Elimination of older leaves may be advantageous due to the removal of infected leaves with leaf spot disease. Removal of older leaves, which are about to senesce will collapse and hanging petioles are no longer useful to the plant. According to David (2001), at full maturity of banana, the leaves provide assimilates for their own metabolism and also generate excess assimilates, which are transported to growing organs. As leaves age, they become less efficient and slowly senesce, the constituents (e.g. proteins) being remobilized and used for new growth, and eventually die.

Generally pseudostem of the most plants with no leaves (T₂) and having only 5 youngest leaves (T₃) broke at a certain height and were fallen. This is probably due to wreaking of pseudostems with decreasing number of leaves. Further, appearance of bunches in these two treatments were poor due to incomplete fruit filling, haphazard ripening and improper shape. This may be due to inadequacy of leaves to continue photosynthesis to produce sufficient amount of carbohydrates. Therefore, it is clear that 75 % of the leaves should be retained without pruning to achieve the maximum benefits of leaf pruning in banana.

CONCLUSIONS

Leaf removal affects bunch weight and finger characters of banana. Bunch yield increased by removing 25% of leaves or by keeping 12 leaves intact at just after the male bud differentiation. Therefore, for the banana var. Embul, under high density planting system in Low Country Dry Zone, it could be concluded that effective leaf number for maximum yield is about 12 leaves per plant at just after the male bud differentiation.

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