INCREASING PINEAPPLE PRODUCTIVITY WITH IMPROVED MANAGEMENT PRACTICES

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ABSTRACT

The performance of the pineapple crop varies in relation to water availability throughout its life cycle, regardless of the relatively low water requirement. Improving soil water distribution at a particular stage of development may increase productivity. Actually, cultivar 'M-D-2 Del Monte' is the most commonly planted pineapple cultivar at the northern region of Puerto Rico. To test the response of pineapple plants to fertilization and drip irrigation and experiment consisting of four treatments arranged in a complete block design with four replications was established at Isabela, PR. The fertilization treatments applied were 1) Granular fertilizer at a rate of 150-150-120-45 kg/ha at planting plus 16 foliar applications of urea and potassium sulphate at rate of 50 kg/ha every two weeks. 2) Same than treatment 1 but with the addition of drip irrigation. 3) Same than treatment 1 applied twice monthly throughout fertigation. 4) Fifty percent than treatment 1 through fertigation. Pineapple harvesting was done 18 months after planting. Neither conventional fertilization (granular) nor fertigation treatments affected fruit weight. There was a tendency of sweeter (Brix=14.08) and heavier fruits (1.3 = kg/fruit) with plants submitted to conventional fertilization with drip irrigation (treatment 2). Pineapple plants under drip irrigation produced heavier fruits and taller plants than rainfed plants. The results indicated that drip irrigation and fertigation is an alternative management practice for cultivar 'M-D-2 Del Monte' at northern Puerto Rico.

INTRODUCTION

In Puerto Rico, farmers cultivate pineapple in the northern and southwestern regions. This crop has a low water requirement; FAO indicates that only 60 mm per month can satisfy the hydric needs. The restricted soil volume can limit the absorption of water and nutrients available in the soil to the roots, therefore irrigation and a fertilizer plan must be established. The plant has morphology and physiology modifications that may help when is affected by water or nutrition stress. One of the modifications is the arrangement and structure of the leaves that absorb nutrients and store water. Many farmers are using drip irrigation as a method of applying water, nutrients and even pest control. What farmers doubt is the efficiency of this method, the investment in relation to its profits and when and how to apply them.

The goal of this research is to provide pineapple growers with basic information on how much irrigation to apply and when to apply it. Irrigation and nutrient application rates are the management practices to be evaluated for a commercially-grown variety. The project will provide the required information to test the hypothesis that using drip irrigation, as part of best management practices, will increase pineapple's yield.

MATERIAL AND METHOD

A field experiments was conducted at Isabela Agricultural Experiment Substation (northern PR) to investigate the response of pineapple cultivar "M-D-2 Del Monte" [*Anana comosus* (L.) Merr] to fertilization rates and fertigation. The soil at the experimental site is classified as an Oxisol (Coto clay, Typic Eutrustox).

Pineapple plants were planted on October 5, 2007 at a space of 0.3 m x 0.40 m x 1.20 m (12' x 16' x 48') in double rows for a density of 52,000 plants/ha. The experiment design consisted of four treatments arranged in a complete block design with four replications. Treatments are described in Table 1. The recommended fertilization rate was 150-150-120-45 kg/ha of N, P_2O_5, K_2O, and MgO, respectively applied at planting and 16 foliar applications of N and K as urea and potassium sulphate at 50kg/ha rate applied every two weeks (Figure 1). Floral induction was made 13 months after planting with the application of etephon. Variables measured were fruit weight, diameter, height, brix and leaves number.

Table 1. Description of fertilization treatments applied to pineapple cultivar "M-D-2 Del Monte".

TRT 1.	Granular fertilizer rate 150-150-120-45kg/ha plus 16 foliar application of 50kg/ha urea and potassium sulphate every two weeks.
TRT 2	Same rate as TRT 1 with the addition of drip irrigation.
TRT 3.	Same rate than TRT 1, but applied throughout fertigation every two weeks.
TRT4.	Fifty percent of TRT 1, but applied throughout fertigation every two weeks.

RESULTS AND DISCUSSION

Due to unknown factors some pineapple plants flowered naturally, therefore plants were harvested 9 to 10 months after planting. Measurements before flowering shows that TRT 3 (Fertigation) and TRT 2 (recommended fertilization with drip irrigation) produced the tallest fruits (Figure 1). Fruit without crown as well as fruit diameter were not affected by either of fertilization treatments (Figure 1). Results indicates that in the first harvest, fruit weight and brix were lower compared to fruits from the second harvest (Table 2). The second harvesting (main harvesting) was made 18 months after planting. Results show that "M-D-2 Del Monte" did not respond to neither conventional fertilization (TRT 1) nor fertigation treatments (TRT 3 and 4) in terms of fruit weight (Figure 3). There was a tendency of sweeter fruits in TRT 2 and TRT 3, but was not significantly different than TRT 1 and TRT 4.

Growth measurements were made every 3 months: The average leaves number was close to 30, while the highest leaves number was achieved 8 months after planting with 41 leaves per plant (Data not shown). Another interesting point that is worth to mention is that total N content in foliar tissue was less than 0.9 %, regardless of fertilization or fertigation treatment (Data not shown).

Figure 1: Left Image: Worker spraying foliar fertilizers on pineapple plants . Right Image: View of double row with "M-D-2 Del Monte" pineapple fruits.

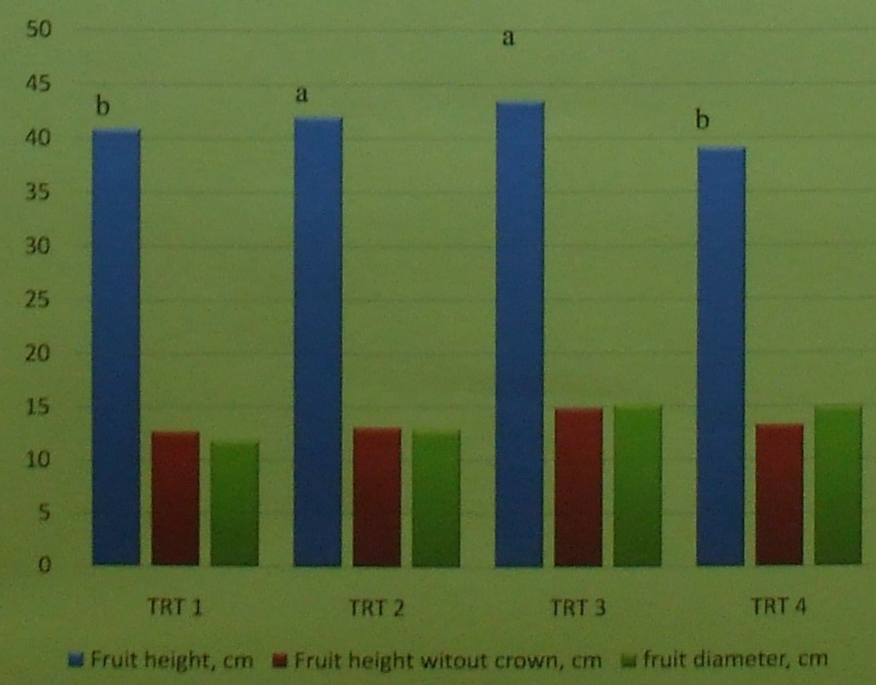

Figure 1. Response of pineapple cultivar "M-D-2 Del Monte" to fertilization treatments of naturally-induced fruits.

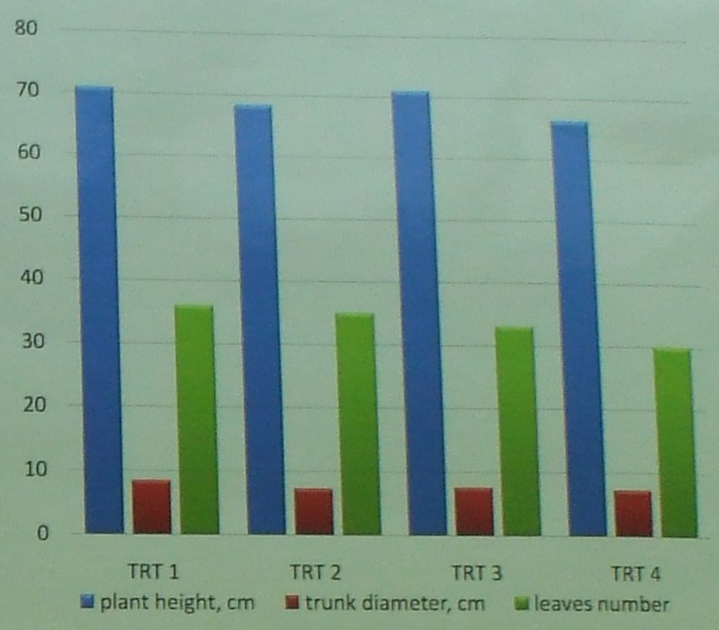

Figure 3. Response of pineapple plants cultivar "M-D-2 Del Monte", to fertilization treatments after flowering induction with etephon.

Table 2. Response of pineapple before (first harvest) and after flowering induction with etephon (second harvest) for average fruit weight and brix.

	First Harvest		Second Harvest	
TRT	Brix	Fruit weight, g	Brix	Fruit weight, g
TRT 1	12.9	1191 b	13.06	1242
TRT 2	12.2	1371 a	14.08	1303
TRT 3	14.4	1308 a	14.07	1199
TRT 4	12.3	1371 a	12.37	1335

CONCLUSIONS

- Results indicated that plant submitted to fertigation and conventional fertilizer with drip irrigation be likely to produce larger and heavier fruits.
-Brix values tend to be increased with drip irrigation and fertigation.
-The results obtained in this research are not conclusive to disregard conventional granular fertilization, but some fruit characteristics tend to be improved, so the use of drip irrigation and fertigation can not be ignored.
- An unknown factor was causing a high variation. Total foliar N content was less than 1.0; normal values ranges is 1.5 to 2.5 %. A new experiment is recommended to study which factor (s) is reducing N use efficiency.

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