CONTENTS

5. SUMMARY

Two field experiments were carried out on a clay loamy soil at the Experimental Field of the Agricultural Research Station–Sabaheia, Alexandria during 1998 and 1999, to study the variation of some traits of ten sweet sorghum (*Sorghum bicolor* L. Moench) varieties, and the effects of these traits on yield and quality under different levels of nitrogen fertilizer.

The experimental design was a split-plot with four replications. The levels of nitrogen fertilizer, i.e., 15, 30 and 45 kg N/fed. in the form of urea (46 %) were arranged at random in the main plots. Whereas, the ten sweet sorghum varieties namely S 405, Sugar drip, Rex, Roma, Rio, Tracy, MN 4490, Brauley, Lollien and MN 1060 were arranged at random within the sub-plots.

The obtained results could be summarized as follows :

5.1. Morphological characters :

1- Stalk height was significantly affected by nitrogen fertilizer, varieties and the interaction between them. The tallest plants were obtained from Rio variety (245.60 cm) by using 45 kg N/fed.

2- Stalk diameter was not affected by nitrogen fertilizer, whereas, it was significantly varied between varieties. MN 1060 variety gave the highest stalk diameter (19.98 mm)

3- Stalk weight per plant was significantly affected by nitrogen levels in the second season only. The application of 45 kg N/fed. produced the highest weight of stalk per plant (953.09 g). The varieties significantly affected stalk weight/plant. MN 1060 variety had the highest stalk weight /plant (1213.02 g).

4- Number of internodes was significantly affected by nitrogen fertilizer in the first season. The nitrogen rate 45 kg N/fed. produced the highest number of internodes/plant (14.16). This character was significantly affected by varieties. The variety MN 1060 had the highest average number of internodes/plant (17.46).

5- Number of leaves /plant significantly increased by increasing nitrogen levels in the first season. The highest number of leaves/plant (19.04) was produced by application of 45 kgN/fed. Number of leaves/plant differed significantly in different varieties. MN 1060 variety had the highest number of leaves /plant (22.34).

6- Leaf area/plant significantly increased by increasing nitrogen levels. The highest leaf area/plant was 0.68 m^2, produced by the application of 45 kgN/fed. Varieties significantly affected the leaf-area/plant and MN 1060 variety gave the highest value (0.73 m^2).

5.2. Yield characters :

1- Stalks yield before and after stripping were significantly affected by nitrogen fertilizer. The highest yields were obtained by the application of 45 kg N/fed. , they were 33.68 and 23.74 ton/fed. for non-stripped and stripped stalks , respectively. The yields of non-stripped and stripped stalks were significantly affected by varieties. MN 1060 and MN 4490 varieties produced the highest yield of stalks before stripping 37.59 and 36.74 ton/fed, respectively. Also, the same two varieties gave the highest yield of stalks after stripping 27.04 and 26.87 ton/fed., respectively.

2- Juice weight and syrup weight per plant were not affected by nitrogen fertilizer levels in both seasons, while both traits were significantly affected due to the different varieties. The highest value of juice

weight/plant was 192.45 g given by MN 1060 variety, while Rio variety gave the highest value of syrup weight/plant which was 35.56g.

3- Juice yield and syrup yield were significantly affected by nitrogen levels in the second season only. The nitrogen level of 45 kg/fed. produced the highest values of juice yield and syrup yield which were 10.08 and 1.77 ton/fed., respectively .Varieties significantly affected juice yield and syrup yield . MN 1060 variety had the highest values of juice and syrup yields which were 11.72 and 2.23 ton/fed., respectively.

5.3. Technological characters :

1- Sucrose percentage was significantly affected by nitrogen levels during the second season only. 45 kgN/fed. rate gave the highest sucrose percentage 8.93 %. In both seasons, sucrose percentage was significantly affected by varieties. The highest percentage of sucrose was 11.05 % given by MN 1060 variety.

2- Glucose percentage was significantly affected by nitrogen fertilizer in the second season. The highest value of glucose percentage was 11.61 given by the dose of 45 kgN/fed. Varieties significantly affected glucose percentage in both seasons. The highest value was 13.91 recorded from MN 1060 variety.

3- Juice extraction and syrup extraction percentages were not significantly affected by nitrogen levels in both seasons, while both traits were significantly affected by varieties. The highest percent of juice extraction was 43.95 % given by Rio variety, while the variety MN 4490 gave the highest percentage of syrup extraction 8.26%.

4- Total soluble solids % (T.S.S.%) was not significantly affected by nitrogen fertilizer levels. T.S.S.% significantly varied in the different varieties. MN 4490 variety surpassed the other varieties and gave the

highest value of T.S.S. 19.16 %.

5-.Purity percentage was significantly affected by nitrogen rates in the second season only. Applicaof 45 kgN/fed. produced the highest percentage of purity 49.66%. Purity percentage was significantly differed due to varietal effects. MN 1060 variety gave the highest value of purity percent 58.84 %.

5.4. By-product yield components :

Forage yield and bagasse yield as by-product components were significantly affected by nitrogen fertilizer in the second season only. The highest forage yield was 10.17 ton/fed. given by application of 45 kgN/fed., while the highest bagasse yield was 13.90 ton/fed. given by applying the same level of 45 kgN/fed . The forage and bagasse yields were significantly affected by varieties in both seasons . MN 1060 variety gave the highest forage yield 10.55 ton/fed., while Roma variety gave the highest bagasse yield 18.77 ton/fed.

5.5. Correlation analysis :

The following characters showed significant and positive correlations :

(i) Stalk height with stalk weight/plant.

(ii) Stalk diameter with each of juice weight, stalk weight, and syrup weight/plant.

(iii) Number of internodes with each of number of leaves, leaf area and stalk weight/plant.

(iv) Number of leaves with each of leaf area, juice weight and syrup weight/plant.

(v) Positive and significant correlations were found among the following characters: leaf area/plant, T.S.S., juice weight/plant, stalk weight/plant, sucrose percentage and syrup weight/plant.

5.6. Path coefficient analysis :

Genetic correlation of eight characters with each of stalk weight and syrup weight per plant were partitioned by path analysis into direct and indirect effects as follows :

i) **Direct and indirect effects versus stalk weight:** Significant correlation between stalk weight and each of stalk height (in both seasons 1998 and 1999), leaf area (in 1999 season) , juice weight (in 1998 season) and sucrose percent (in 1998 season) were due to the direct effect of these traits. Meanwhile, the significant correlation between stalk weight and each of stalk diameter (in 1998 season), number of internodes (in 1999 season), leaf area, T.S.S., juice weight and sucrose percentage (in both seasons) could be attributed to the indirect effects via other traits specially leaf area per plant.

ii) **Direct and indirect effects versus syrup weight:** The direct effects of juice weight and sucrose percentage seem to be the cause of the significant correlation between syrup weight and both traits. Meanwhile, the significant correlation between syrup weight and each of stalk diameter (in 1999 season), number of leaves (in 1998 season), leaf area (in both seasons), T.S.S. (in both seasons), sucrose percent (in 1999 season) could be due to the indirect effects via other traits specially juice weight per plant.

5.7. Recommendations :

1- Sweet sorghum plants fertilized with 45 kg N/fed. recorded the highest values in most of studied characters , so this nitrogen rate seems to be the best for high yield and quality.

2- MN 1060 variety possessed superiority over the other varieties in most of the characters of yield and quality,followed by MN 4490, Rio and Roma varieties.

3- The following characters: leaf area, T.S.S.%, juice weight, stalk weight and syrup weight per plant could be considered by the breeder for effective selection during breeding programs.