Effect of Row Orientation, Row Spacing and Plant Population Density on Grain Yield and Other Agronomic Traits in Maize (*Zea mays L.*)

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ABSTRACT

The present investigation was conducted at three locations, i.e., Sakha, Gemmeiza and Nubaria Agric. Res. Stns., Field Crops Res. Inst., Agric. Res. Center, during the two growing seasons of 2007 and 2008 to study the effect of rows orientation, rows spacing and plant density on maize growth and yield. Single cross hybrid (SC 10) was used in this study. Two field trials were conducted at each location, one for row orientation of East-West (E-W), and the other for North-South (N-S). Number of treatments in each trial was nine treatments which were the combinations of: 1. Three row spaces; i.e., 60, 70 and 80 cm, and 2. Three plant population densities; i.e., 20,000, 25,000 and 30,000 plants fad^{-1}. Each row orientation treatment was planted in a separate experiment, arranged according to a split-plot design, with four replications, where row spacing was arranged in the main plots, while, plant population density treatments was arranged in the sub- plots. Combined analysis was performed among row orientation experiments, where replications were nested within row orientation for each year. The previous crop was wheat for all trials. Soil type was clay loam at Sakha and Gemmeiza, whereas, it was calcarious at Nubaria. Results indicated that planting maize on rows oriented from East to West (E-W) led to a significant reduction in number of days from planting to 50% tasseling and silking, at Gemmeiza and Nubaria in 2007 season, and at Nubaria in 2008 season. This treatment led, also, to a significant increase in plant and ear height at all locations in the two years, except for Sakha in 2008 season, for plant height, and Gemmeiza in 2007 for ear height. The same treatment significantly increased grain yield at all locations in the two years, except at Sakha and Gemmeiza in the second season. Planting maize on rows, spaced 80 cm, significantly reduced the number of days from planting to 50% tasseling and silking at both locations in 2007 and 2008 growing seasons. Maize plants became tall with high ear placement when planted on rows spaced of 80 cm. Planting maize on 80 cm rows led to a significant increase in plant and ear height, as well as grain yield per plant and per faddan, compared with 60 and 70 cm row-spacing's. The effect of plant population density on plant height differed with locations and seasons (environments). Increasing plant population density up to 30,000 plants fad^{-1} led to a significant reduction in plant height at Gemmeiza, while, increasing plant population density up to 30,000 plants, at Nubaria, resulted in a significant increase in plant height in both growing seasons. For ear height, the effect of plant population density was significant only at Nubaria in 2007 growing season, while, it was significant at all locations in 2008 growing season. Increasing plant population density was associated with a significant reduction in grain yield per plant at all locations in both growing seasons. Grain yield (in ardab per faddan) significantly increased as plant population density increased up to 30,000 plants fad^{-1}

Key words: maize, rour orientaiont, plant density, location

INTRODUCTION

Corn producers continually search for new practical procedures to increase productivity and to reduce production costs. Plant density, distribution and row orientation (direction) may play an important role on maize growth and grain yield. It is well known that good distribution of maize plants permits canopy to intercept more light energy and, hence, increases vegetative growth and grain yield. On the other hand, controlling plant population density can be achieved through controlling hill spacing, row width and row direction. Also, controlling inter- and intra-plant competitions would help maize plants to intercept more light, absorb more water and improve nutrient uptake from soil. At low population density, grain yield is limited by number of plants per unit area.

Concerning row direction (orientation), Robinson (1975) and Seif *et al* (1988), in grain sorghum, showed that north-south row direction recorded a significant higher seed index, grain weight head^{-1}, grain yield plant^{-1} and stover yield, as compared with east-west row direction. Talentino (1982) reported that row direction significantly influenced the interception and transmission of solar radiation through the plant canopy. They, also, found that the daily intercepted solar radiation was higher at north-south row direction at 53 days after sowing. El-Murshedy (1991) reported no advantages in grain yield due to sowing maize on east-west or north-south rows direction. However, north-south direction outyielded east-west direction in stover yield. On the contrary, Abdrabou (1996) found that maize plants, grown from east-west direction, significantly increased grain yield faddan^{-1} than those grown from north-south. Ismail (1997) found