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ORIGINAL ARTICLE

Effect of Planting Density on Physiological Parameters in Maize (*Zea mays* L.)

[1]Payam Moaveni, [2]Hosseein Aliabadi Farahani and [2]Kasra Maroufi

[1]Islamic Azad University, Shahr-e-Qods Branch, Tehran, Iran.
[2]Member of Young Researchers Club, Islamic Azad University, Shahr-e-Qods Branch, Tehran, Iran.

Payam Moaveni, Hosseein Aliabadi Farahani and Kasra Maroufi: Effect of Planting Density on Physiological Parameters in Maize (*Zea mays* L.)

ABSTRACT

This study was conducted as factorial on the basis complete randomized block design with four replications for one year planting in 2010-2011 at Islamic Azad University Shahr-e-Qods Branch, Tehran, Iran. The factor of study included planting densities (70000, 90000, 110000 and 130000 plants/ha). The characters were measured consist of: high plant, leaf length, stem diagonal and total grain yield. The results showed that the effect of high plant, leaf length, stem diagonal and total grain yield in $P \leq 0.05$. Mean comparison showed that the highest high plant (184.11 cm) and leaf length (9.99 cm) were achieved by 130000 planting density but the highest stem diagonal (1.97 cm) and total grain yield (390.95 t/ha) were achieved by 70000 planting density.

Key words: Planting density, high plant, leaf length, stem diagonal, total grain yield and maize.

Introduction

Maize *(Zea maize L.)* is one of the most important cereal crop grown principally during the summer season in Egypt. Maize grain is used for both human consumption and poultry feed. The local production of the crop is not sufficient to meat the continuous increase of consumption (Hussain et al., 2004). Plant density is one of the most important cultural practices determining grain yield, as well as other important agronomic attributes of this crop. Stand density affects plant architecture, alters growth and developmental patterns and influences carbohydrate production and partition [5]. At low densities, many modern maize hybrids don't tiller effectively and quite often produce only one ear per plant. There are many studies on plant density for different types of pepper [6,10]. Plant density has a pronounced influence on plant development, growth and the marketable yield of many vegetable crops [16]. A number of studies have indicated a linear increase in fruit yield when plant density is increased [8]. Porter and Etzel, [15] and Ahmed, [1] reported that increasing plant density resulted in a greater yield of bell pepper fruit. Some studies have documented a positive relationship between plant visitation rate and plant density [11,12,19], while others have not [2,4], and there is at least one report of a decrease in visitation rate with plant density [17]. The longer visitation sequences predicted in isolated plants have been confirmed by several workers [11,7,3]. How these density effects combine into resulting visitation rates to individual flowers has received much less attention, and no clear pattern has emerged from the results so far. In addition to the effects density may have on mean pollinator response to variation in floral display size, it may also change the actual shape of the response curve. This study was conducted to effect of planting density on physiological parameters in maize (Zea mays L.).

Materials and methods

This study was conducted as factorial on the basis complete randomized block design with four replications for one year planting in 2010-2011 at

Corresponding Author

Payam Moaveni, Islamic Azad University, Shahr-e-Qods Branch, Tehran, Iran.
E-mail: kasramaroufi@yahoo.com

Islamic Azad University Shahr-e-Qods Branch, Tehran, Iran. The factor of study included planting densities (70000, 90000, 110000 and 130000 plants/ha). The characters were measured consist of: high plant, leaf length, stem diagonal and total grain yield.

Statistics analysis:

Data were subjected to analysis of variance (ANOVA) using Statistical Analysis System (Spss) computer software at $P < 0.05$.

Results and discasion

High plant:

The results showed that the effect of planting densities was significant on high plant, in $P \leq 0.05$. Mean comparison showed that the highest high plant (184.11 cm) were achieved by 130000 planting density and lowest high plant (164.76 cm) were achieved by 70000 planting density. Also increased spot dry weight by increasing planting density (Fig 1).

Leaf lenght:

The results showed that the effect of planting densities was significant on leaf length, in $P \leq 0.05$. Mean comparison showed that the highest leaf length (99.90 cm) were achieved by 130000 planting density and lowest leaf length (92.17 cm) were achieved by 70000 planting density. Also increased spot dry weight by increasing planting density (Fig 2).

Stem diagonal:

The results showed that the effect of planting densities was significant on stem diagonal, in $P \leq 0.05$. Mean comparison showed that the highest stem diagonal (1.97 cm) were achieved by 70000 planting density and lowest stem diagonal (1.35 cm) were achieved by 130000 planting density. Also decreased spot dry weight by increasing planting density (Fig 3).

Table1: Means Comparison

plant density (plant/ha)	High plant (cm)	Leaf length (cm)	Stem diagonal (cm)	Grain yield (t/ha)
70000	146.76d	9.21d	1.97a	390.95a
90000	171.74c	9.44c	1.73b	377.55b
110000	175.8b	9.85b	1.42c	368.65c
130000	184.11a	9.99a	1.35c	359.3d

Means within the same column and factors, followed by the same letter are not significantly difference.

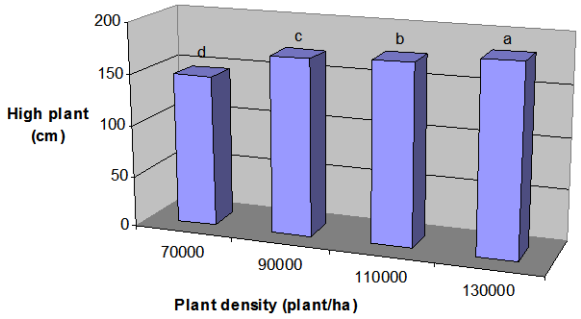

Fig. 1: Effect of plant density on high plant in maize.

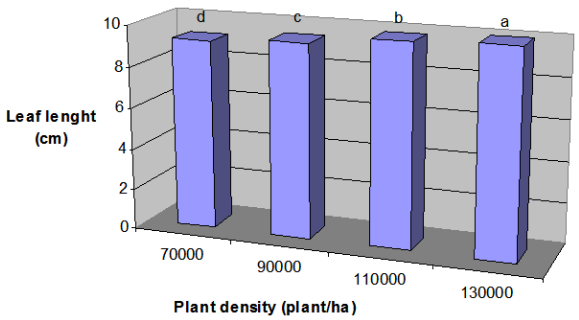

Fig. 2: Effect of plant density on leaf length in maize.

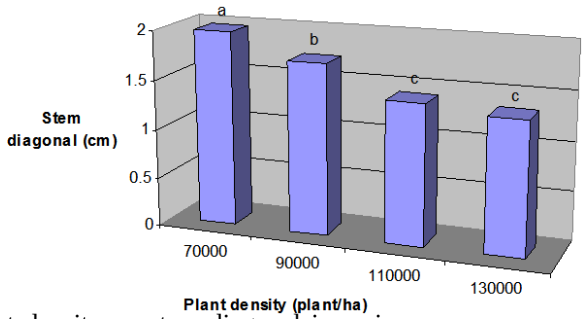

Fig. 3: Effect of plant density on stem diagonal in maize.

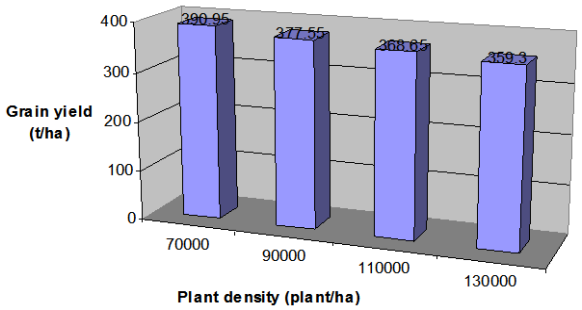

Fig. 4: Effect of plant density on grain yield in maize.

Grain yield:

The results showed that the effect of planting densities was significant on grain yield, in $P \leq 0.05$. Mean comparison showed that the highest grain yield (390.95 t/ha) were achieved by 70000 planting density and lowest grain yield (359.40 t/ha) were achieved by 130000 planting density. Also decreased spot dry weight by increasing planting density (Fig 4).

Yield increases with increasing plant density up to a maximum for a corn genotype grown under a set of particular environmental and management conditions and declines when plant density is increased further [20]. Water availability is probably the most important uncontrollable factor affecting optimum plant density for maize grain yield under rainfed production systems [13]. Increasing plant density increases leaf area index and consequently water consumption [18]. Maize grain yield declines when plant density is increased beyond the optimum plant density primarily because of decline in the harvest index and increased stem lodging [19]. Turkington and Morrall, [21] tried to establish the relationship between plant density and sclerotinia stem rot, finding that disease was inconsistently related to their measures of canopy density. This inconsistent relationship was attributed to the difficulty in quantifying crop density.

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