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ORIGINAL ARTICLE

Effects of Planting Density on Quantity and Quality Features in Maize (Zea Mays L.)

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Payam Moaveni, Mahdi Farid Afshar, Hosseein Aliabadi Farahani and Kasra Maroufi: Effects of Planting Density on Quantity and Quality Features 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: spot dry weight, stem dry weight, leaves dry weight and silage yield. The results showed that the effect of planting densities was significant on spot dry weight, stem dry weight, leaves dry weight and silage yield in $P \leq 0.05$. Mean comparison showed that the highest spot dry weight (399.75 g), stem dry weight (348.3 g) and leaves dry weight (271.9 g/m^2) were achieved by 70000 planting density but the highest silage yield (70.82 t/ha) were achieved by 130000 planting density.

Key words: Planting density, spot dry weight, stem dry weight, leaves dry weight, silage yield and maize.

Introduction

The maize is one of the most cultivated and consumed cereals in the world [10] with an important role as human staple food, mainly in less developed countries [3]. The number of plants is determined experimentally which gives an indication of maximum utilization of available resources. If these resource limitations are overcome through agronomic manipulations, there will be scope for increasing the plants per unit area, thereby increasing the yield without drastic reduction in individual plant yield. But, this hypothesis may not be true always to give the desired result. With increase in the number of plants, growth, nutrient uptake and yield may be reduced due to one or more limiting factors even through efforts are made to overcome resource limitations. Density dependence has been a key focus of population ecology since its inception [1,2] and the topic has gained even greater importance with the growth of conservation biology. Habitat fragmentation and degradation may have serious implications for plant populations; small and scattered populations may have difficulty attracting pollinator visits, potentially resulting in reduced reproductive performance. Plant species that have not evolved mechanisms to overcome such reproductive difficulties may suffer from a positive feedback effect as pollinator visitation rates fall, causing lower seed set and recruitment, declining population density over time, and consequently further reduced reproductive performance [21]. Many studies have suggested that crop density is related to sclerotinia stem rot incidence [19,18,17,14], but few have demonstrated this relationship in canola. Turkington *et al.*, [20] found a positive relationship between canopy density and sclerotinia stem rot disease incidence over a six-year study period sampling hundreds of farmers' fields. Some disease forecast models indicate that canopy density contributes to the development of sclerotinia stem rot. Sigvald *et al.*, [18] created a computer-based sclerotinia stem rot prediction model, which included crop density as one of the major factors.

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Both size and density of a plant species are known to affect pollination and subsequent reproductive performance [4,16]. This study was conducted to effects of planting density on quantity and quality features 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 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: spot dry weight, stem dry weight, leaves dry weight and silage 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

Spot Dry Weight:

The results showed that the effect of planting densities was significant on spot dry weight, in $P \leq 0.05$. Mean comparison showed that the highest spot dry weight (399.75 g) were achieved by 70000 planting density and lowest spot dry weight (375.15 g) were achieved by 130000 planting density. Also decreased spot dry weight by increasing planting density (Fig 1).

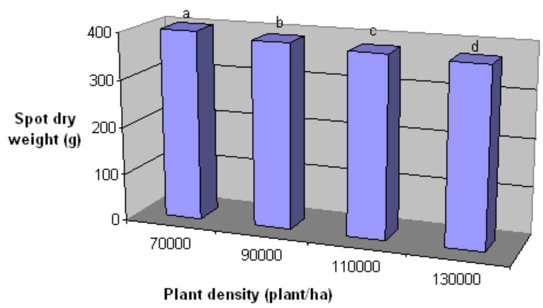

Fig. 1: Effect of plant density on spot dry weight in maize.

Stem Dry Weight:

The results showed that the effect of planting densities was significant on stem dry weight, in $P \leq 0.05$. Mean comparison showed that the highest spot dry weight (348.3 g) were achieved by 70000 planting density and lowest spot dry weight (334 g) were achieved by 130000 planting density. Also decreased spot dry weight by increasing planting density (Fig 2).

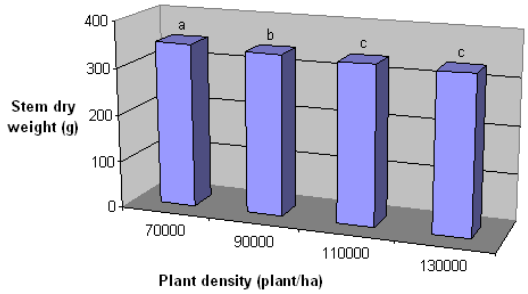

Fig. 2: Effect of plant density on stem dry weight in maize.

Leaves Dry Weight:

The results showed that the effect of planting densities was significant on leaves dry weight, in $P \leq 0.05$. Mean comparison showed that the highest leaves dry weight (271.9 g/m^2) were achieved by 70000 planting density and lowest leaves dry weight (251.7 g/m^2) were achieved by 130000 planting density. Also decreased spot dry weight by increasing planting density (Fig 3).

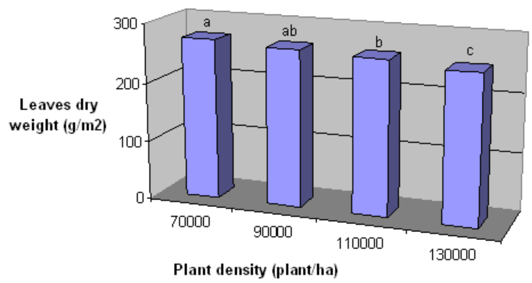

Fig. 3: Effect of plant density on leaves dry weight in maize.

Silage Yield:

The results showed that the effect of planting densities was significant on silage yield, in $P \leq 0.05$. Mean comparison showed that the highest silage yield (70.82 t/ha) were achieved by 130000 planting density and lowest silage yield (49.46 t/ha) were achieved by 70000 planting density. Also increased spot dry weight by increasing planting density (Fig 4).

Similar results were also found in many previous studies [15,5,8,6]. Kebe *et al.* [13] reported that low seed yield occurred at extremely low and high densities, as a result of the number of branches/unit area reduced.

Table 1: Means Comparison.

Plant density (plant/ha)	Spot dry weight (g)	Stem dry weight (g)	Leaves dry weight (g)	Silage yield (t/ha)
70000	399.75a	348.3a	271.9a	49.46c
90000	389.15b	341.3b	266.2ab	57.06bc
110000	380.5c	337.15c	261b	67.37ab
130000	375.15d	334d	251.7c	70.82a

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

These findings are in accord with the previous results reported by Weber et al, (1966) and Hamad [12] they indicated that plants produced at the highest densities set fewer pods than those at the lowest densities. Coefficients of variation for dry weight and plant size generally increased with plant density and were greatest for ear components [9,7]. Alternatively, high plant density can provide a safer habitat from predators, but may interfere with an organism's ability to disperse or find food [11].

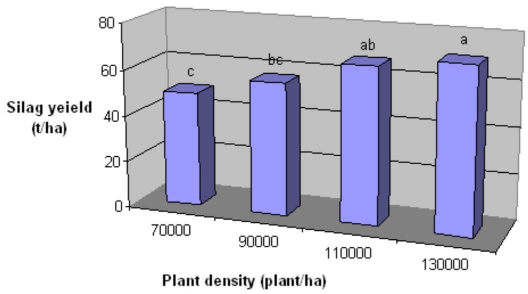

Fig. 4: Effect of plant density on silage yield in maize.

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