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Investigating the Most Suitable Time for Iron Spraying on Morphological Properties and Yield of Karoon and 660 Hybrid Corns in Khuzestan

¹Ali Gholami, ²Leila Azizi Moghadam, ³Mohammad Barzegari

¹Department of Soil Science, Khuzestan Science and Research Branch, Islamic Azad University, Ahvaz, Iran.

²Department of Soil Science, Khuzestan Science and Research Branch, Islamic Azad University, Ahvaz, Iran.

³Safabad Agricultural Research Center, Khuzestan, Dezful, Iran.

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ABSTRACT

In recent years, cultivation, production and consumption of this crop has increased considerably in most countries so that it became the third crop in consumption after wheat and rice. This research conducted in experimental fields of Safi Abad Dezful Agricultural Research Center in summer 2012. This research was done in completely randomized block experimental design (CRBD) as a factorial experiment. The corn varieties were Karoon new single cross hybrid and 670 new single cross hybrid. Soil sampling of 0-30 cm and 30-60 cm depths, land preparation was done and major elements included phosphorus, potassium and nitrogen were spread on land by uniform distribution according to the result of soil test. Mean comparison results showed that grain number in rows for variety of Karoon with 39.5 was the highest and variety of 660 with 35 grains in a row had the lowest grain number. Mean comparison results showed that in spraying treatments, the highest iron percentage was for grain filling stage with 18.1% and the lowest iron percentage was for control with 8.7%.

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INTRODUCTION

The most important countries in producing corn are including USA, Argentina, Colombia, Mexico, Romania etc. Given that it has high amount of carbohydrates and starch, and it has high production, corn is one the best forage plants for fresh use or silage. Also according to Cakmack *et al* (2010) reports, iron deficiency reduces whole protein level because of iron direct involvement in protein synthesis. A close and positive relationship between grain protein level and iron in corn has been identified and it is likely that genes controlling protein and iron levels are segregating together. The same location of iron, protein and amino acids, and very close and positive relationships between protein and grain iron shows grain proteins as a tank for iron. Iron is one of the essential minor elements for plant growth and plant absorbs it in bivalent form (Fe^{+2}). It is essential for many physiologic and biochemical processes such as chlorophyll synthesis, oxidation and reduction reactions, photosynthesis and respiration and enzyme systems. Although the total level of this element is high in the soil, some chemical and physical properties of soils like alkaline pH, low organic matter, excessive utilization of phosphorus fertilizers, has affected iron absorbing in plants and reduced its availability (Runaghi 2002).

MATERIALS AND METHODS

This research was carried out in experimental fields of Safi Abad Dezful Agricultural Research Center in summer 2012. The research center is located in south west of Khuzestan 120 km from province center with the height of 82 m of the sea (48° 32' E 32°22' N).

4. Details of field method:

This research was carried out in completely randomized block experimental design (CRBD) as a factorial experiment. The corn varieties were:

1-Karoon new single cross hybrid corn

2-670 new single cross hybrid corn

After soil sampling of 0-30 cm and 30-60 cm depths, land preparation was done and major elements

Corresponding Author: Ali Gholami, Department of Soil Science, Khuzestan Science and Research Branch, Islamic Azad University, Ahvaz, Iran.
E-mail: a.gholami@khuzestan.srbiau.ac.ir

included phosphorus, potassium and nitrogen were spread on land by uniform distribution according to the result of soil test. Then the farrows were made and the experiment was planned. The experiment was carried out in completely randomized block experimental design as $2 \times 3 \times 4$. The main factor or variety included 2 levels of Karoon and 670, and the subsidiary factor or minor elements included 4 levels of iron spraying in vegetative, generative, grain filling times and control. Each level of minor element spraying included one planting row in the middle, and two rows in the sides. It is notable that varieties were placed randomly in blocks. Planting date was 2nd of July and spraying was done in time during the cultivation stage.

5. Grain number in row:

ANOVA results showed that variety and time treatments on grain number in planting rows were significant at $P < 0.01$, but variety and time interaction was not significant on this trait (Table 1).

Table 1: The ANOVA results of corn yield and yield components

Source of variations	Df	Mean square			
		Grain number in row	1000 grain weight	Grain yield	Iron percentage of grain
Replication	2	4.1	870	259176	4.1
Variety	1	22.8**	241*	201872**	2.4ns
Spraying time	3	16.7**	1560*	26375257**	77.6**
varieties * spraying time	3	6.1ns	57ns	228977	1.3ns
Error	14	11.7	218	396271	3.1
CV%		8.9	6.2	7.6	9.4

Mean comparison results showed that grain number in rows for variety of Karoon with 39.5 was the highest and variety of 660 with 35 grains in a row had the lowest grain number (Table 2).

Table 2: mean comparison results of varieties effect on yield components of corn

Variety	Grain number in row	1000 grain weight	Grain yield
Karoon	39.5 a	315 a	9785 a
660	35 b	301 b	6861 b

In spraying treatments, the highest grain number in row was obtained in generative stage with 41 grains and control had the lowest grain number with 35.1 grains in a row (Table 3).

Table 3: mean comparison results of spraying time effect on yield components of corn

Spraying time	Grain number in row	1000 grain weight	Grain yield	Iron percentage of grain
generative	41 a	41 a	8560 a	11.5 c
Vegetative	38 b	38 b	7182 b	16.2 b
Grain filling	38.5 b	38.5 b	7467 b	18.1 a
Control with no spraying	35.1 c	284 d	4419 c	8.7 d

Table 4: mean comparison results of varieties and spraying time interaction effect on yield components of corn

Variety	Spraying time	Grain yield
Karoon	generative	7750 b
Karoon	Vegetative	8640 a
Karoon	Grain filling	7130 c
Karoon	Control with no spraying	3860 e
660	generative	6650 d
660	Vegetative	6740 d
660	Grain filling	7290 c
660	Control with no spraying	3455 e

6. 1000 grain weight:

ANOVA results showed that variety and time treatments were significantly effective on 1000 grain weight at $p < 0.05$, but the interaction of spraying and time had no significant effect on 1000 grain weight (Table 1).

Mean comparison results showed that Karoon with 315 gr, had the highest 1000 grain weight and 660 with 301 gr had the lowest 1000 grain weight (Table 2).

7. Grain yield:

According to ANOVA results, variety and time treatments and their interaction were significantly effective on grain yield at $P < 0.05$ (Table 1).

Mean comparison results showed that Karoon with 9785 kg had the highest grain yield and 660 with 6861 kg had the lowest grain yield (Table 2).

In spraying treatments, the highest grain yield was for generative stage with 8560 kg/ha and the lowest

grain yield was for control with 4419 kg/ha (Table 3).

8. Iron percentage of grain:

ANOVA results showed that spraying time treatments were significantly effective on iron percentage of grain ($p < 0.01$), but variety treatments and interaction of variety and spraying time were not significantly effective on iron percentage of grain (Table 1).

Mean comparison results showed that in spraying treatments, the highest iron percentage was for grain filling stage with 18.1% and the lowest iron percentage was for control with 8.7% (Table 3).

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