Available online at www.scholarsresearchlibrary.com

Scholars Research Library

Scholars Research Library

Annals of Biological Research, 2012, 3 (8):3998-4001
(http://scholarsresearchlibrary.com/archive.html)

Annals of Biological Research
Scholars Research Library
ISSN 0976-1233
CODEN (USA): ABRNBW

Effect of phosphorus fertilizer and micronutrients foliar application on sorghum yield

Issa Piri

Agriculture Department, Payame Noor University, Tehran, I. R. of Iran

---

ABSTRACT

In order to study effect of phosphorus fertilizer and micronutrients foliar application on yield sorghum, a field experiment was conducted in at 2011 in Research Farm of Payame Noor University of Zahedan, Iran. This experiment was done as split plot Based on randomized complete block design with three replications. Experiment treatments included: micronutrients foliar application containing elements (Fe + Zn + Mn) and control (without micronutrients foliar application) as main plots and four levels of phosphorous fertilizer: 50, 100, 150 and 200 kg/ha as sub plots. The results showed that Effect of micronutrients foliar application was significant on plant height, length of flag leaf, grain yield and biological yield. Phosphorus fertilizer had significant effect on yield and grain weight, so that the highest amount of these factors obtained from 200 kg/ha treatment. These results indicated that application of phosphorus fertilizer with micronutrients foliar application is a useful method for yield increase of sorghum.

Key words: phosphate fertilizer, micronutrients, yield, sorghum

---

INTRODUCTION

Sorghum is the one of most important cereal crop grown in world. It is widely used in both the food and feed industries. There are opportunities to increase world sorghum production in order to save the foreign exchange. Genetic improvement and the expansion of the cultivated area with suitable management practices are two main ways of reaching higher production levels.

Sorghum due to its abundance features, particularly the high adaptation to conditions of different climates, rapidly was spread in world (Imam, 2004). Increase of sorghum production and improvement of quality characteristics through consumption of fertilizer is the most important goals of yield increase. Mehrvaez and chaichi (2008). Micronutrient elements are needed in relatively very small quantities for adequate plant growth and production, their deficiency may cause great disturbance in the physiological and metabolic processes involved in the plant. Thus, the application of micronutrients fertilizer in the cultivation zone may not be meeting the crop requirement for root growth and nutrient use. The alternative approach is to apply these micronutrients as foliar sprays. Six micronutrients that is Mn, Fe, Cu, Zn, B and Mo are known to be required for all higher plants (Welch, 1995).

Macro and micronutrients deficiencies have been reported for different soils and crops (Hussain et al., 2006). Soylu et al. (2005) and Kenbaev and Sade (2002) reported significant increase in number of spikes m-2 in wheat with foliar application of different micronutrients individually or in combination. Guenis et al. (2003) and Soleimani (2006) reported marked increase in number of grains spike-1 of wheat for foliar application of boron and zinc, respectively. Torun et al. (2001) and Grewal et al. (1997) reported increased wheat production with application of zinc and boron over control.

This research was done in order to evaluating the effect of micronutrients and phosphorus fertilizer on sorghum yield in Zahedan region.

MATERIALS AND METHODS

This experiment was conducted during seasons of 2011 at research farm of Payame Noor University of Zahedan, Iran. The site lies at longitude 61°53´, and latitude 25°28´ and the altitude of the area is 1370 m above sea level. The climate of this area is arid with dry and hot summer. The mean annual rainfall is about 70 mm. The soil characteristics of research farm is clay loam in texture (Table 1).

Table 1. The result of some soil chemical characteristic before planting (depth 0-30)

Absorbent sulphur (ppm)	Absorbent potassium (ppm)	Available phosphorus (ppm)	total N (%)	organic carbon (%)	organic carbon pH (%)	EC (Ds/m)
0.4	1.7	3.9	4.6	0.35	7.7	2.9

The experimental design was split plot, using randomized complete block design with three replications. The treatments consisted of: micronutrients foliar application containing elements (Fe + Zn + Mn) and control (without micronutrients foliar application) as main plots, and four levels of phosphorous fertilizer: 50, 100, 150 and 200 kg/ha as sub plots.

Planting was done as rows with 75 cm distance and space on per row 20 cm with 8 rows in per subplot. Micro element was sprayed approximately 4 liters per thousand at stem elongation stage and the emergence of crown flower. Seeds before planting were inoculated with biological phosphate fertilizer and chemical phosphorus fertilizer as strip a takes under seed. All operations were done regularly during the growing season. At the end of crown flower emergence stage, agronomic characteristics including plant height, stem diameter, length and width of flag leaf were measured. After the Physiology maturity of each experimental plot. Biological and seed yield were determined by eliminating the effect of marginal. After drying, harvest index, was achieved. At last data were analyzed using SAS statistical packages, mean comparison was done using Duncan at 5% probability level and Charting was performed using Excel.

RESULTS AND DISCUSSION

Plant height

Analysis of variance showed that effect of foliar treatments at 5 percent level and phosphorus fertilizers at 1 percent level was significant. Mean to suggest increases in plant height under influence of foliar with micronutrients and phosphorus fertilizers. As the highest plant height was obtained from application 50 kg/ha P coupled micro element spray and the lowest plant height was achieved of control treatment (without micronutrients foliar application) (table2). Phosphorus fertilizer because of root development, increased root uptake. Micronutrients such as iron, zinc are used indirectly in making chlorophyll. Indeed these elements easily sprayed on leaf and would increase chlorophyll concentration in leaves, consequently this matter lead to increase of plant height and yield.

Stem diameter

The effect of foliar micronutrients application on stem diameter wasn't significant, but phosphorous fertilizers on it was significant. The results showed that maximum stem diameter belonged to 50 kg/ ha P. and between phosphorus fertilizer treatments there isn't significant difference in terms of increase in stem diameter. 200 kg/ha P fertilizer treatment than 50 kg/ha P treatment showed increase of 3.00 percent in stem diameter (table 2).

Flag leaf length

The results show that the flag leaf length was located under the influence of phosphorus fertilizer treatments and micro element spray. The results of mean comparison showed that the flag leaf length would increase under the influence of spray with micronutrients elements and phosphorus fertilizers (table 2). 200 kg/ ha P showed increase of 5.79 percent on the flag leaf in comparison to 50 kg/ ha P treatments. Use of biological fertilizers increased flag leaf length and durable leaf, that this matter lead to increasing photosynthesis and dry matter accumulation in rice (Ahmad et al., 2004).

Table 2. Means comparison of effects of micronutrients and phosphorus on plant height, Stem diameter, Flag leaf length and Flag leaf width

Treatment	Plant height (cm)	Stem diameter (mm)	Flag leaf length (cm)	Flag leaf width (cm)
Micronutrients foliar application				
foliar application	173.54a	25.41 a	33.73 a	5.14a
No foliar application	160.151b	20.39 a	30.89 b	5.03a
phosphorus fertilizer (kg/ha)				
50	153.02 c	22.97 c	26.84 c	4.81b
100	166.81 b	25.91 b	30.89 b	5.30a
150	170.96 b	26.51b	31.49 b	5.31a
200	182.41 9a	30.48 a	34.71 a	5.33a

Mean followed by similar letters in each column, are not significantly different at the 5% level of probability.

Flag leaf width

Flag leaf width was not affected by micro element spray, but Phosphorus fertilizers had significant effect on flag leaf width. Mean comparisons showed that the highest and the lowest flag leaf width was observed from treatments of 200 kg/ha P and control respectively. 200 kg/ha showed increase 12.39 percent in the flag leaf width in comparison to the 50 kg/ ha P (Table 3).

Table 3. Means comparison of effects of micronutrients and phosphorus on yield

Treatment	Grain Yield (ton/ha)	Biological yield (ton/ha)	Harvest index (%)
Micronutrients foliar application			
foliar application	6.85a	21.37 a	26.15 a
No foliar application	6.40b	16.51 b	18.12 a
phosphorus fertilizer (kg/ha)			
50	4.98d	15.12 c	17.36 d
100	6.39c	18.43 b	21.05 c
150	7.29b	19.74 ab	24.16 b
200	7.53a	21.96 a	28.42 a

Mean followed by similar letters in each column, are not significantly different at the 5% level of probability.

Biological yield

Effect of phosphorus fertilizers and micro elements spray was significant on corn biological yield. Mean comparisons showed that the highest biological yield obtained from treatment of 200 kg/ha P and the lowest belonged to 50 kg/ha P treatment (table 3). 200 kg/ ha P, showed increase of 77.16 percent in the biological yield compared with the 50 kg/ha P treatment. Foliar application of micronutrient increased biological yield. These results are according to others researches (Russel et al., 1984).

Grain yield

Analysis of variance showed that grain yield located under the influence of phosphorus fertilizer and micronutrients foliar. According to the results of mean comparison, the highest yield Obtained from 200 kg/ ha P and the lowest yield was observed from 50 kg/ha P (table 3). Between fertilizer treatments there is significant difference on the Grain yield. Foliar application of micronutrient increased grain yield.

Harvest index

Phosphorus Fertilizer had significant effect on the harvest index, but effect of micronutrients foliar wasn't significant on it. Mean comparisons indicate that the highest harvest index achieved from treatment of 200 kg/ ha P, and the lowest was observed in 50 kg/ ha P treatment (table 3). 200 kg/ha P compared to 0 50 kg/ ha P showed increase of 99.30 percent in harvest index. Phosphorous fertilizer increased due to increasing economic performance and harvest index. These results are according to others researches (Aslam khan et al., 2005).

REFERENCES

[1] Ahmad A. Noaim Al, Hamad H (2004). Effect of Bio-fertilization Along with Different Levels of Nitrogen Fertilizer Application on the Growth and Grain Yield of Hassawi Rice (*Oryza sativa* L.). Vol.5 No.2 1425-1430.
[2] Aslamkhan M. Abid M, Hussain N, Usman masood M (**2005**). *International Journal of Agriculture and Biology.* 7 (3): 511-514.
[3] Grewal HS, Zhonggu L, Graham RD (**1997**). *Plant and Soil*, 192(2): 181-189.
[4] Guenis A, Alpaslan M, Unal A (**2003**). *Turk. J. Agric*., 27: 329-335.

[5] Hussain MZ, Rehman N, Khan Roohullah MA, Ahmed SR (**2006**). *Sarhad J. Agric*., 22(2): 283-285.
[6] Imam, y. 20**0**4. Cereal farming Press Shiraz University, PP175.
[7] Kenbaev B, Sade B (**2002**). *Comm. Soil Sci. Plant Anal*., 33(3-4): 533-5544.
[8] Mehrvarz S, Chaichi MR, Alikhani HA (**2008**). *American-Eurasian J. Agric. & Environ. Sci.*, 3 (6): 855-860
[9] Russel, MP, Wilhelm WW, Olson RA, Power JF (**1984**). *Crop science*. 24: 28-32.
[10] Soleimani R (**2006**). The effects of integrated application of micronutrient on wheat in low organic carbon conditions of alkaline soils of western Iran. 18th World Congress of Soil Science.
[11] Soylu S, Sade, B Topalv A, Akgun N, Gezgin S (**2005**). *Turk. J. Agric*., 29: 275-286.
[12] Torun A, ltekin IGÃ, Kalayci M, Yilmaz A, Eker S, Cakmak I (**2001**). *J. Plant Nut*., 24(11): 1817-1829.
[13] Welch RM, Allaway WH, House WA, Kubota J (**1991**). Geographic distribution of trace element problems. In: Mortvedt J.J., ed. Micronutrients in agriculture, 2nd Ed. Madison, Wisconsin: SSSA Book Ser. 4. SSSA, pp. 31-57.