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Full Length Research Paper

Effects of Foliar Application of Stimurel, Force 4-L and Dulzee on Yield and Yield Components of Sorghum Speedfeed

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Sorghum Speedfeed is an annual grass that is extremely drought tolerant, making it an excellent choice for arid and dry areas. Sorghum Speedfeed has special adaptations to weather extremes and is a very stable source of nutrition as a result. This study was established for determining the effects of foliar application of Stimurel, Force 4-L and Dulzee on yield and yield components of Sorghum Speedfeed. A factorial experiment was carried out using Randomized Complete Bloke design with 4 replicates and 4 treatments in Saatlo Agricultural Research Center in Urmia, Iran. The results of data analysis showed that foliar application has significant effect on some characteristics such as panicle length, tiller number, crude fiber, fresh matter, and dry weight but no effect on height and thickness of plants.

Keywords: Foliar application, Sorghum Speedfeed, Stimurel, Force 4-L, Dulzee, yield

INTRODUCTION

Foliar feeding refers to the application of fertilizers to a plant's leaves. It is not a substitute for maintaining adequate levels of plant nutrients in the soil but can be beneficial in certain circumstances. Most commonly, it is recommended for alleviating specific micronutrient deficiencies. In recent years, products have been developed that contain growth hormones, natural plant sugars, microorganisms and other ingredients. According to a number of authors, soil fertilization, when combined with foliar feeding, improves both yields and the biological value of vegetables (Osinska and Kolota 1998, Kolota and Osinska 2000). Interest in foliar feeding was stimulated during the 1950's when Dr. H.B. Tukey and Dr. S.H. Wittwer at Michigan State University, using radioactive isotopes of known plant nutrients, found that nutrients were absorbed by plant foliage and translocated throughout the plant. In some plants the rate of movement was one foot per hour! They also reported that foliar feeding resulted in about 95 percent efficiency of nutrient use versus only about 10 percent efficiency of nutrient use from soil fertilizer application. There are 2 main paths of entry for foliar nutrients: the cuticle and the stomata.

Cuticle entry: The cuticle is a waxy layer covering leaves, flower petals and fruits. Its primary function is to prevent moisture loss from plants and to protect the plant from injury. It is typically thicker on upper leaf surfaces than on lower leaf surfaces and is impermeable to aqueous (water) solutions; oily solutions will penetrate the cuticle more readily. Cracks can occur in the cuticle and can serve as a port of entry for foliar applications. On young, immature leaves the cuticular layer is not as well developed as an older leaves.

Stomata entry: The stomata of plants are located almost exclusively on the leaves. These pores are only a few millionths of an inch in diameter and their primary function is to breathe for the plant. They allow carbon dioxide, the building block of plants, to pass into the leaf and here the chlorophyll molecules, using sunlight for energy, convert the carbon dioxide molecules into simple sugars. The stomata also allow the by-product of this reaction, oxygen, to escape from the plant. A third function of the stomata is to allow the escape of water

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Table 1. Physical and chemical analysis of soil.

Soil texture	Ph	SP (%)	Clay (%)	Silt (%)	Sand (%)	O.C	N (%)	P (ppm)	K (ppm)
Silt clay loam	8	57	33	55	12	1.2	0.12	12.0	800

vapor that evaporates from the inside of the leaves to cool the plant. Stomata are usually closed at night, and can close during the hottest part of the day. The distribution and occurrence of stomata, as well as their size and shape, varies widely from one plant species to another. Broadleaf crops and tree crops commonly have most of their stomata on the lower leaf surface while grass species may have about the same number on both surfaces. As examples, small white beans commonly have 40,000 stomata per square centimeter on their lower surface and only 3,000 on their upper surface, while sorghum has 16,000 on the lower surface and 11,000 on the upper surface. In horticultural practice, foliar fertilization is also recommended as the most effective method of supplying plants with nutrients under deficiency conditions (Trejo-Tellez et al. 2007). Moreover, Kolota and Biesiada (2000) indicated the possibility of limiting mineral fertilizer use by means of application of foliar fertilization.

Sorghum is the fifth most important cereal crop grown for human consumption in the world being surpassed only by rice, wheat, barley and corn. Sorghum speedfeed is a crop of world-wide importance and is unique in its ability to produce under a wide array of harsh environmental condition (Moghaddam et al., 2007). Most of sorghum grown in Asia and the African tropics is used for human food and also fed to livestock or poultry (Gul et al., 2005). Inorganic fertilizers are important inputs in any agricultural production system and Nitrogen is the essential element required for plant growth in relatively large amounts and its deficiency can result reduce in dry matter, crude protein and grain yield (Ashiono et al., 2005). One factor that continues to be a problem in farming systems is fertilizers management (Khosla et al., 2000). Great efforts have been made to improve sorghum productivity by new cultivars and increasing the efficiency of added fertilizers (Amal et al., 2007). Foliar application refers to the spraying on leaves of growing plants with suitable fertilizer solutions. In many cases, aerial spray of nutrients is preferred and gives quicker and better results than the soil (Jamal et al., 2006). The objectives of this study were: To determine the Effects of Foliar Application of some natural propellants like Stimurel, Force 4-L and Dulzee on Yield and Yield Components of Sorghum Speedfeed.

MATERIALS AND METHODS

This research was been carried out in Saatlo Agricultural Research Station (37°44 N, 45°10 Ealtitude 1338 m) during the planting seasons of 2010. Generally, climates are dominant in this region. The average annual temperature is 11. 3°C, rain fall is 74.2 mm. The highest humidity is 70%. The soils of experimental area as showed in the table 1 were silt clay loam and chemical analysis showed the PH 8 and EC 0.57. The experimental design was a factorial using completely Randomized Block design with 4 replications. Seed was sown by hand in 3-5 cm depth at 166.000 ha in 7 row plots 70 cm apart and 5 m long. Sowing took place on July 2010.

Simulators

Stimurel: A group of Amino Acid based fertilizers, which act as natural chelation compound, to give growers large and integral choice of fertilizers in all stages of plant growth.

Force 4-L: Is the natural growth stimulator extracted from the Seaweed *Ascophyllum nodosum*, which contains more than 60 macro and micro elements in addition to natural growth regulators, organic acids and sugars.

Dulzee: Effective foliar Fertilizer which contains Macro and Micro nutrients. The Simulators were purchased from Chemival S.A (Lima, Peru)

Treatments were applied in 3 stages, two, four and six weeks after sown. Analysis of variance of the data from each attribute was computed using MSTATC program. The Duncan's new multiple range tests at 5% level of probability was used to test among mean values.

RESULTS AND DISCUSSION

Effect of used treatments on crude fiber content, panicle length, tiller number, fresh matter and dry weight was illustrated in Table 2. As seen, all the treatments had positive effects on these factors compared to control. The results of data analysis showed that foliar application has significant effect on some characteristics such as panicle length, tiller number, crude fiber, fresh matter, and dry weight but no effect on height and thickness of plants. The effect of foliar application showed significant differences in data analysis. Foliar Application of Force 4-L and Dulzee had resulted in significant increase in crude fiber (34.55% for Dulzee and 32.73% for Force 4-L), tiller number (1.64 for Dulzee and 2.41 for Force 4-L), fresh matter (10.14 kg/m^2 for Dulzee and 9.06 kg/m^2 for Force 4-L), and dry weight (2.17 kg/m^2 for Dulzee and 1.96

Table 2. Analysis of variance for the effects of foliar application of Stimurel, Force 4-L and Dulzee on yield and yield components of Sorghum Speedfeed.

Source of variation	(DF)	Mean squares Cf %	panicle length	tiller number	Fresh matter	dry weight
rep	3	0.01	5.97	0.28	0.00	0.00
treat	3	4.98**	18.51*	3.38**	3.96**	0.12**
Error	9	0.05	4.14	0.29	0.01	0.00
C.V	-	0.71	8.61	42.05	1.38	4.43

^{NS}Non-significant, *significant at $p<0.05$ and **significant at $p<0.01$

Table 3. Mean comparison effect of foliar application of Stimurel, Force 4-L and Dulzee on yield and yield components of Sorghum Speedfeed by Duncan's Multiple Range Test (DMRT).

Treatments	Cf %	panicle length (cm)	tiller number	Fresh matter (kg/m^2)	dry weight (kg/m^2)
marker	32.16 c	26.75 a	0.41 b	7.73 c	1.74 c
Dulzee	34.55 a	22.52 b	1.64 a	10.14 a	2.17 a
Force 4-L	32.73 b	21.95 b	2.41 a	9.06 b	1.96 b
Stimurel	32.23 c	23.30 b	0.66 b	9.26 b	1.96 b

In each column, means with the similar letters are not significantly different at 5% level of probability using DMRT

kg/m^2 for Force 4-L). But foliar Application of Stimurel just resulted in significant increase in fresh matter (9.26 kg/m^2), and dry weight (1.96 kg/m^2) and did not cause any significant effect on the crude fiber properties and tiller number. All the treatments significantly decreased panicle length compared with marker (Table 3).

CONCLUSION AND RECOMMENDATIONS

Fertilizers have been proven to play an important role in crop production. Although many commercial fertilizers have been shown to increase yields, many of these products are unable to generate a yield increase large enough to cover the input cost of the fertilizer application. Natural propellants have generated a revenue increase per acre that is 2-3 times greater than the input cost of the application. By increasing root development and supplying nutrients directly to the plant, foliar feeding helps the plant achieve maximum growth throughout a variety of adverse growing conditions. Based on the results of this study, foliar application of propellants on sorghum Speedfeed was found to be very effective on increasing plants yeald. The plant can synthesize amino acids needed to produce plant tissues but consumes energy for its photosynthesis. Amino acids play an important role in photosynthesis, protein synthesis and respiration. It has been found that we can supply plant with ready amino acids, and to save energy and accelerate biochemical reactions and stimulate growth in general, which will lead for better quality and higher yield. According to results of this research Stimurel can Increase plant ability to absorb nutrient and increase photosynthesis quality. It also enhances protein production in short time with less energy consumption and totally its result appears as growth development and increase in yield. Force 4-L returns nutritive balance to plant and stimulates its physiological system. Since Crop production in Uremia is impaired by highly saline soil and water shortage. This research highlights the importance of foliar feeding crops as a means of correcting nutrient deficiencies that occur during the growing season. Additionally, because of the efficiency of nutrient use in foliar applications, growers can be confident they are maximizing their yield by Foliar Application of propellants.

REFERENCES

Amal G, Zaki M, Hassanein MS (2007). Responses of grain sorghum to different nitrogen sources. Res. J. Agric. Biol. Sci. 3: 1002-1008.

Ashiono GB, Gatuiku S, Mwangi P, Akuja TE (2005). Effect of nitrogen and phosphorus application on growth and yield of dual-purpose sorghum (*Sorghum bicolor* (L.) Moench), E1291, in the dry highlands of Kenya. Asian J. Plant Sci. 4: 379-382.

Gul I, Saruhan V, Basbag M (2005). Determination of yield and yield components and relationship among the components of grain sorghum cultivars grown as main crop. Asian J. Plant Sci. 4: 613-618.

Jamal Z, Muhammad H, Nadeem A, Fayyaz MC (2006). Effects of soil and foliar application of different concentrations of NPK and foliar application of $(NH_4)_2SO_4$ on different yield parameters in wheat. J. Agron. 5: 251-256.

Khosla R, Alley M, Davis H (2000). Nitrogen management in no tillage grain sorghum production: Rate and time of application. Agron. J. 92: 321-328.

Kolota E, Biesiada A (2000). The effect of foliar fertilization on yield and

quality of carrot roots. Roczn. AR w Poznaniu CCCXXIII, Ogr. 31(1): 331-335.
Kolota E, Osinska M (2000). The effect of foliar nutrition on yield of greenhouse tomatoes and quality of the crop. Acta Physiol. Plant. 22(3): 373-376.
Leach K, Hameleers A (2001). The effects of a foliar spray containing phosphorus and zinc on the development composition and yield of forage maize. Grass and Forage Science. *56:* 311–315.
Moghaddam, H, Chaichi, MR, Mashhadi HR, Firozabady GS, Zadeh AH (2007). Effect of method and time of nitrogen fertilizer application on growth, development and yield of grain sorghum. Asian J. Plant Sci. 6: 93-97.
Osinska M, Kolota E, (1998). Utilization of Ekolist in foliar nutrition of field vegetable crop grown at different nitrogen rates. Folia Univ. Agric. Stetin. Agricult. 190(72): 247-252.
Trejo-Tellez LI, Rroriguez-Mendoza MN, Alcantar-Gonzalez G, Gomez-Merino FC, (2007). Effect of foliar fertilization on plant growth and quality of Mexican Husk Tomato (*Physalis ixocarpa* Brot.). Acta Hort. 729: 295-299.