

Study on the Effect of Foliar Application of Urea on Yield and Yield Components of Sorghum

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Abstract: In order to evaluate the effect of urea foliar application of urea on yield and yield components of Kimia cultivar grain sorghum, a factorial experiment was carried out using Randomized Complete Bloke design with 3 replicates and 12 treatments in Saatlo Agricultural Research Center in Uremia, Iran. The factors in this research were foliar application stages (knee stage, tassel emergence, knee stage + tassel emergence) and the foliar application percent (0, 50, 75 and 100%). The results of data analysis showed that foliar application has significant effect on some characteristics such as grain yield, number of grains in a panicle but no effect on length, weight and thickness of panicle. In treatment stages knee stage has higher result in grain yield as number of grains in a panicle but foliar application in tassel emerges is more effective in thousand kernel weight.

Key words: Grain sorghum, foliar application, urea, yield

INTRODUCTION

Grain Sorghum (*Sorghum bicolor* L. Moench) is a crop of world-wide importance and is unique in its ability to produce under a wide array of harsh environmental condition (House, 1995; Moghaddam *et al.*, 2007). It is considered the forth cereal crops after maize, wheat and rice (Agricultural Economic, 1995) and most of grain sorghum grown in Asia and the African tropics is used for human food and also fed to livestock or poultry (Gul and Basbag, 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 (Ashinio *et al.*, 2005). One factor that continues to be a problem in farming systems is N fertilizer management (Khosla *et al.*, 2000). Nitrogen is the most nutrient for high grain sorghum productivity. In soils with good aeration nitrate is the dominant available form of nitrogen in higher plants. Great efforts have been made to improve sorghum productivity by new cultivars and increasing the efficiency of added fertilizers (Amal *et al.*, 2007). Increasing nitrogen use efficiency in plants is considered as a major way to decrease nitrate accumulation and its leaching in soil (Amal *et al.*, 2007). The best method and time of nitrogen fertilizer application will significantly

improve both quantity and quality of crops as well as nitrogen use efficiency. 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). Most of absorption by the leaf takes place by diffusion through the cuticle. Application of N near flowering increased post flowering N uptake, grain protein content and grain protein concentration (Woolfolk *et al.*, 2002).

The objectives of this study were: To determine the effective method of N fertilizer application and to evaluate the best time of N fertilizer application.

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 2006. Generally, climates are dominant in this region. The average annual temperature is 11. 3°C, rain fall is 74.2 mm. The highest humidity was 70%. The soils of experimental area as showed in the table were silt clay loam and chemical analysis showed the PH 8 and EC 0.57 (Table 1).

The experimental design was a factorial using completely Randomized Block design with 3 replications. The factors in this research were foliar application stages

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	800

(knee stage, tassel emergence, knee stage + tassel emergence) and the foliar application percent (0, 50, 75 and 100%).

Variety of grain sorghum was Kimia: Seed was sown by hand in 3-5 cm depth at 166.000 ha in 5 row plots 60 cm apart and 5 m long. Sowing took place on 04 June 2006. The experimental area was fertilized with 100 kg ha Nitrogen (N) and 250 kg ha Phosphorus (P) before planting. After 3 weeks plants were thinned.

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

The results of data analysis showed that foliar application has significant effect on some characteristics such as grain yield, number of grains in a panicle but no effect on length and thickness of panicle. In treatment stages, knee stage has higher resulted as in grain yield as the number of grains in a panicle although foliar application in knee stage + tassel emergence is more effective in thousand kernel weight. Increase in the foliar application percent in ratio to soil application causes better results in grain yield and its components (Table 2).

Grain yield: The effect of foliar application stages and percent showed significant differences in data analysis. Between foliar application stages, Knee stage had better result in improving grain yield, although foliar application in 2 stages was in the same statistical group (Fig. 1). Tassel emergence had the lower effect in grain yield. In foliar application percents, 100% was in higher statistical group and 75, 50 and 0% were in the second rank as showed in Fig. 2. The interaction of two factors was insignificant.

Yield components: In yield components, some (panicle length, panicle weight and panicle thickness) showed insignificant differences to factors but number of grains in panicle showed significant difference in foliar application stages but insignificant respect to foliar application percent. Between stages knee stage had better result in improving grain yield and the other treatments (tassel emergence and knee stage + tassel emergence) were in the second statistical group. Although, foliar percent factor

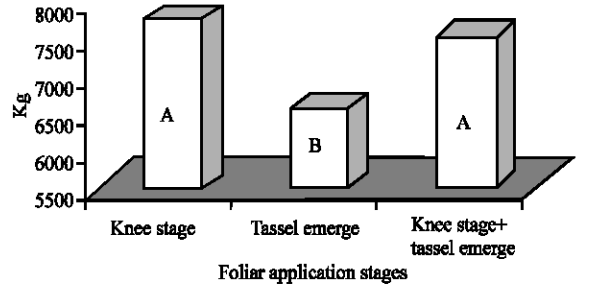


Fig. 1: The effect of foliar application stages on grain yield

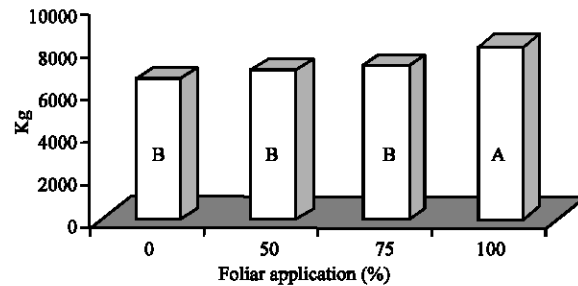


Fig. 2: The effect of foliar application percent ratio soil application on grain yield

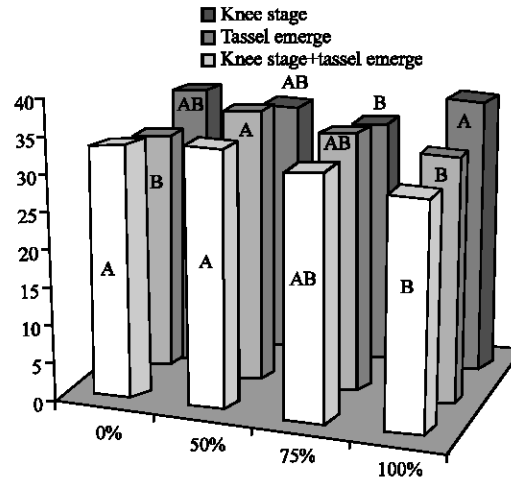


Fig. 3: The interaction effect of foliar application stages and percent on TKW

was in significant but showed increase in panicle grain number. The interaction of these factors was shown in Fig. 3. In thousand kernel weight, adverse to grain number of the panicle foliar application in stages were, respectively tassel emergence, knee stage + tassel emergence

Table 2: Mean variance analysis in yield and yield components

Components	Freedom degree	Grain yield (Kg ha ⁻¹)	1000 grain weight (g)	Number of grain/panicle	Panicle weight (g)	Panicle thickness	Panicle weight
Rep.	2	36.75	2.707	53007.2	0.982	0.139	54.865
A	2	716.266*	23.045*	251620*	0.0295 ^{ns}	2.279 ^{ns}	403.325 ^{ns}
B	3	86.938*	5.637 ^{ns}	48037.562 ^{ns}	0.709 ^{ns}	2.73 ^{ns}	51.557 ^{ns}
A×B	6	210.703 ^{ns}	10.946*	141193.653*	0.932 ^{ns}	0.552 ^{ns}	192.584 ^{ns}
E	22	87.125	2.773	30994.475	1.971	1.461 ^{ns}	101.507
CV		10.63	4.9	6.23	6.075	3.8	9.23

A: Foliar application stages (knee stage, tassel emerge and Knee stages tassel emerge), B: Foliar application percent (0, 50, 75 and 100%), *Significant difference in 5% level probability, Ns = insignificant difference in 5% level probability

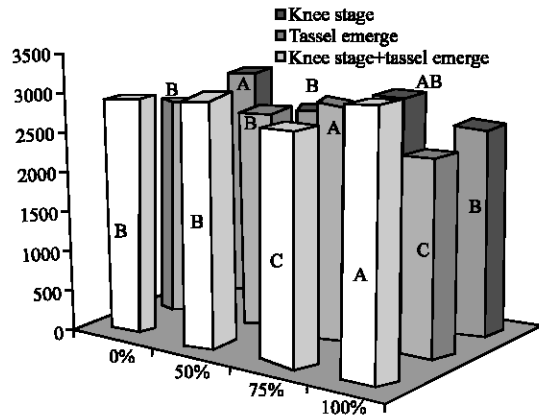


Fig. 4: The interaction effect of foliar application stages and percent on grain number of panicle

and knee stage. The interaction was shown in Fig. 4. Our results are the same as reported by researchers Sarandon and Gianibelli (1990).

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