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EFFECT OF FOLIAR FERTILIZER ON GROWTH AND YIELD OF SEVEN POTATO CULTIVARS (*SOLANUM TUBEROSOM* L.)

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Abstract

An experiment was conducted out during 2009 to study the effect of spraying numbers (0, 2 and4) of Alaska foliar fertilizer (N:12, P_2O_5:12, K_2O:36, Fe:0.05%, Cu:0.005%, Mn:0.03% , Zn:0.01% , B: 0.02% , Mo:0.003%) on growth and yield of 7 potato cvs. (Draga, Aladin, Elpaso, Kurado, Diseree, Provento and Red Brown). Factorial experiment included 21 treatments arranged in Random Complete Bloke Design (RCBD) with 4 replications. Results showed that foliar fertilizer had a significant effect on plant height, tuber weight and total yield. Potato cvs. differ in all studied parameters. High yields were obtained from Red Brown, Provento and Draga cvs. Interactions had a significant effect on the most studied parameters.

Key words: *foliar fertilize , potatoes cultivars.*

INTRODUCTION

Potato (*Solanum tuberosum* L.) is the most important tuber crop, and it is the fourth world crop after wheat, rice and maize. Moreover, potato is an important vegetable and a good source of antioxidants (Chen *et al*., 2007). Although potato is quite adaptable to planting conditions, it has, as every culture, certain requirements for ecological conditions. Stability of a varieties features and preserving quality in different conditions has great importance; total and graded yield and quality factors are affected by cultivars and location (Tomasiewicz *et al*., 2003; Haase *et al*., 2005). Both yield and quality of potato are affected by cultivar, environmental conditions and cultural practices. In trial with Burren, Arnova and Aladin cv., Burren was a superior in yield, but Arnova was super in tuber mean weight (Kadum, 2011).

Fertilizer application has important effects on the quality and yield of potato (Westermann, 2005). Uptake of fertilizer nutrients (NPK) by potato per unit area and time is high because of the rapid rate of early growth and tuber bulking. Foliar fertilization has potential for an important role in potato production.

Nitrogen supply plays an important role in the balance between vegetative and reproductive growth for potato (Alva, 2004). Many previous studies have shown that N applications can increase total and/or marketable tuber yield (Kara, 2002; Zebarth *et al*., 2004; Zelalem *et al.*, 2009). It is suggested that late application of N in foliar sprays can be benefit to potato crop with a long growing season and reduce environmental losses of N.

Phosphor application significantly increased plant height, marketable tuber yield and marketable tuber number (Zelalem *et al*., 2009). One of the major problems in the use of phosphate fertilizer is the fixation of applied phosphate by the soil. Foliar P application resulted in higher tuber yield (Ekelof, 2007). Application of K increases plant height and crop vigour. It increases both the rate and duration of tuber bulking. Its application assists in the translocation of carbohydrates from leaves to tubers. Potassium increases the size but not the total number of tubers (Trehan *et al*., 2001). Foliar application of K increased potato tuber yield. The increasing of foliar K fertilizer rates (2.5%) was associated with the highest yield (Habib *et al.,* 2011). Foliar application of micronutrients has been one of the approaches to achieve an improvement the nutritional status, yield of potato end to optimize use of chemical fertilizers (Khalifa *et al*., 2003). Potato plants foliar treated with Unigreen (containing macro and micronutrients) 2.5 g/l and Solu Potash (50% K_2O) 3.0 g/l gave higher total yield and higher number of marketable tubers per plant

and total number of tubers per plant (Abdul Rasool *et al*., 2010).

The present investigation aimed to study the response of 7 Potato cultivars to the number of foliar fertilizer sprays.

MATERIALS AND METHODS

A field experiment was carried out on a farm 15 km south of Hilla, during 2009 to study the effect of spraying numbers (0, 2 and 4) of Alaska foliar fertilizer (N:12, P_2O_5: 12, K_2O: 36, Fe: 0.05%, Cu: 0.005%, Mn: 0.03%, Zn: 0.01%, B: 0.02%, Mo: 0.003%) on 7 potato varieties (Draga, Aladin, Elpaso, Kurado, Diseree, Provento, and Red Brown) obtained from Nahar Alawrad Company. Factorial experiment included 21 treatments arrangement in Random Complete Bloke Design (RCBD) with 4 replications.

Potato seed Tubers were sown on 6 Feb. at 25 cm apart in the rows. Each plot consisted of 3 rows, each of five meters in length and 70 cm wide. The plot area was 10.5 m. DAP fertilizer was added at the rate of 200 kg/ha dressing 10 cm bellow the tubers. The first foliar spray was made after 40 days, in which plants were blossoming and were at the early tuber set stage. The other foliar sprays were made at weakly intervals. Plant length (cm), number of shoots was determined at 90 days after planting. At harvesting (21 May), fresh tuber yield were recorded in terms of number of tubers per plant and tuber weight as well as total yield.

The obtained data were subjected to the analysis of variance procedure and treatment means were compared to the L.S.D. test according to Steel and Torrie, 1980.

RESULTS AND DISCUSSIONS

Data presented in (Table 1) showed that, length of potato plants were significantly increased as a result of plant spraying with Alaska fertilizer compared with the control treatment. In addition, there were no significant differences between 2 or 4 foliar times of sprays. The increases in plant height may be due to the role of such macro and micro nutrients in the physiological process and cell division and elongation which indirectly affect tissue formation and consequently vegetative growth of plant. These results are in good accordance with those obtained by (Khalifa *et al.,* 2003; Abdul Rasool *et al*., 2010; Kadum, 2011).

The varieties had a significant effect in plant height. It appeared that it was related to type of various varieties, (Tafi *et al.,* 2010). The interaction had a significant effect also.

Table 1. Effect of Varieties and Foliar High-K Fertilizer Number on Plant Height (cm)

Average var.	4 time spray	2 time spray	control	Var.
64.3	68	66	59	Draga
56.3	63	56	50	Aladin
65.7	67	68	62	Elpaso
55.7	62	59	46	Kurado
62.7	69	68	51	Diseree
65.0	69	72	54	Provento
56.3	61	59	49	Red Brown
-	65.6	64	53	Average of spray

L.S.D. 0.05 var. = 3.1 fertilizer = 2.03 interactions = 5.37

Results in (Table 2) showed that foliar fertilizer had no significant effect on stem numbers. Potato varieties had a significant effect on stem numbers, and Elpaso had the largest than other cultivars, it gave 4.6 stem which reached significant only with Aladin that gave 4.0 cm. In fact the stem numbers are formed after planting and before adding foliar fertilizer and cannot affect by it. It can be mentioned that the stem number in different cultivars is as one of the internal and compatible characteristics affected by the plant environmental condition (Henricksen and Molgaard, 2005).

Table 2. Effect of Varieties and Foliar High-K Fertilizer Number on Stem Numbers

Average var.	4 time spray	2 time spray	control	Var.
4.27	4.2	4.4	4.2	Draga
4.00	4.2	4.1	3.7	Aladin
4.60	4.7	4.7	4.4	Elpaso
4.27	4.3	4.1	4.4	Kurado
4.17	4.4	4.2	3.9	Diseree
4.30	4.3	4.6	4.0	Provento
4.17	4.2	3.9	4.1	Red Brown
-	4.3	4.3	4.1	Average of spray

Foliar fertilizer caused an increase in tuber weight as compared with control (Table 3). Four times of foliar fertilizer had no significant effect on this parameter as compared with two

times. It may be attributed to the increase in vegetative growth by fertilizer and in the role of potassium in translocation of produced photosynthetic assimilates and its accumulation in storage organs (Habib *et al.,* 2011). Haeder *et al*., (1973) indicated that with adequate K nutrition two thirds of the labeled photosynthesis product passed within one day into the tubers when after flowering intensive growth of tubers set in. With insufficient K supply only half of the photosynthesis product was translocated to the tubers during the same period Draga and Aladin varieties were superior in this parameter as compared to other varieties. It may be a variety characters. The interactions had a significant effect and Draga+ 4 time sprayed was significant as compared with all interactions.

Table 3. Effect of Varieties and Foliar High-K Fertilizer Number on Tuber Weight (gm)

Average var.	4 time spray	2 time spray	control	Var.
71.2	76.8	71.9	65.0	Draga
63.6	63.4	63.4	64.0	Aladin
59.0	59.0	60.6	57.5	Elpaso
57.0	58.2	56.0	56.6	Kurado
57.3	56.5	58.9	56.6	Diseree
57.8	56.8	57.2	59.6	Provento
60.1	62.9	59.9	57.5	Red Brown
-	62.0	61.1	59.6	Average of spray

Foliar fertilizer caused a significant effect on yield as compared with the control (Table 4). It could be concluded that increasing productivity of potato plants as a result of foliar fertilizer, may be due to increased in weight and numbers of tuber/plant which in turn increased the total tubers yield (ton/h.). This effect might be due to that potassium plays an important role in the transport of assimilates and nutrients (Allison *et al*., 2001) as well as the enhanced effect of other materials contents of the fertilizer. These findings were supported by previous investigators such as (Habib *et al*., 2011; El-Sirafy *et al.,* 2008). The interactions had a significant effect and Draga+4 time sprayed gave the highest, which differed significantly as compared with Aladin and Elpaso interaction. These results agreed with (Kadum, 2011).

Table 4. Effect of Varieties and Foliar High-K Fertilizer Number on Tuber Yield (ton/h)

Average var.	4 time spray	2time spray	control	Var.
27.999	29.553	30.045	21.398	Draga
21.873	23.693	25.094	16.894	Aladin
20.602	21.737	22.022	18.049	Elpaso
23.403	26.265	24.640	19.304	Kurado
23.829	25.975	27.297	18.357	Diseree
23.480	25.595	24.525	20.320	Provento
24.116	26.9654	27.666	17.718	Red Brown
-	25.683	25.899	18.959	Average of spray

L.S.D. 0.05 var. = 2.543 fertilizer = 1.665 interactions = 4.403

CONCLUSIONS

Potato cultivars differ in growth and yield because of the differences in inheritance and the ecological conditions. Experiments could be made to select the best cultivar to the local conditions. This study was done to evaluate seven cultivars with foliar fertilizer at south region of Babylon. it could be concluded that potato plants foliar with fertilizer contain high potash, caused an improve in growth and tubers yield per unit area, and it can also recommend that planting Red Brown, Provento and Draga varieties in south region of Babylon Governorate.

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