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The study of effect of two types of liquid Humic fertilizer on dry matter in maize SC variety

Ali Mohammadpour khanghah

Department of Agronomy and Plant Breeding, Ardabil Branch, Islamic Azad University, Ardabil, Iran

Corresponding author Email : ali.mohammadpour.khaneghah@gmail.com

ABSTRACT: Humic acids (HA) are a major component of organic fertilizers. In order to study the response of maize genotype against the application of peat and leonardite based liquid humic fertilizers, an experiment was conducted at experimental field of Islamic Azad University, Ardabil Branch in 2009-2010 cropping year. The Experiment was conducted of randomized complete block design (RB) with three replications. Treatment used on the Single cross 704 genotype was at three Conditions (peat based humic fertilizer; leonardite based humic fertilizer; without the application of humic fertilizer). Results showed that there was significant difference between the experimental conditions (test solution) in terms of dry matter percentage of stem at 1% level and in terms of dry matter percentage of leaf at 5% level. The results of the comparison data on the experimental conditions (test solution) showed the liquid Humic fertilizer based on Leonardite, in terms of traits such as dry matter percentage of stem and dry matter percentage of leaf and respectively, with average of 48.94 and 54.58 had the greatest percentage.

***Keywords*:** Humic liquid fertilizer, Maize, Dry matter.

INTRODUCTION

Maize (Zea mays L.) is among highly consumed grains and obtains after wheat and rice; it is the main nutritional source in the world. The plant is C4 plant in terms of photosynthesis and has a better growth in tropical and subtropical (Emam, 2008) and native regions of South and Central America. (Khodabandeh, 1998). Maize position in providing seeds, forage and livestock feed and industrial use has increased its importance in Iran. Developing planting maize in Iran in accordance to self-sufficiency program is of significance. Hence, by implementing programs to increase maize seed production during recent years, this crop has quickly grown in cultivation, production and performance (Cakir, 2004). Humic acids (HA) are a major component of organic fertilizers, and as heterogeneous molecules of different sizes that are self-organized in supramolecular conformations (Piccolo, 2002), they are also the most reactive ones. HA effects on plant physiology are mainly positive, and they include enhancement of biomass yields (Ayuso et al., 1996; Arancon et al., 2006), induction of lateral roots emergence and ATPase activity (Canellas et al., 2002), increase of cell respiration and membrane uptake of nutrients, and exertion of hormone-like activities (Nardi et al., 2002). Given the HA structural complexity, a structure–activity approach aimed at linking effects on plant physiology with specific humic chemical properties is a difficult task. One way to partly reduce the HA heterogeneity is to carry out a size-fractionation of humic matter and characterize the separated size-fractions by combined pyrolysis and NMR spectroscopy (Piccolo et al., 2002). The characteristics of such more homogenous humic molecules may be related to well defined soil– plant process of ecological importance.

The following research tries to compare the humic liquid fertilizer effects dry matter in maize SC variety in Ardabil region.

MATERIALS AND METHODS

In order to study the response of maize genotype against the application of peat and leonardite based liquid humic fertilizers, an experiment was conducted at experimental field of Islamic Azad University, Ardabil Branch (5 km west of Ardabil City) in 2009-2010 cropping year. The Region has a semiarid and cold climate, where the temperature during winter season usually drops below zero. This region is located 1350m above the sea level with longitude and latitude being 48.2˚ eastern and 38.15˚ northern, respectively. Average annual minimum and maximum temperatures are -1.98 and 15.18˚C respectively; whereas maximum absolute temperature is 21.8 ˚C; and mean annual precipitation has been reported to be 310.9 mm. The soil of the field was alluvial clay with a pH ranging from 7.8-8.2. The Experiment was conducted of randomized complete block design (RB) with three replications. Treatment used on the Single cross 704 genotype was at three Conditions (peat based humic fertilizer; leonardite based humic fertilizer; without the application of humic fertilizer). Each experimental plot included 3, 320cm long rows recurring 80cm from each other containing plants recurring at 20cm distance. Pretreatment of seeds were done on the basis (Table 1) of 220 mL per 10 L of water to be applied for 1 ton of seeds. Weed-fighting was done both mechanically and manually during all growth stages. Liquid humic fertilizer was prepared and applied based on 400 mL per 50 L of water for 1 hectare of maize plantation. The prepared solution was sprayed upon the aerial part of the plants during 4-5th leaf stage, appearance of reproductive organs, flowering and grain filling stages. All the samples were taken randomly from competitive plants at middle rows. Studied traits included dry matter percentage of stem and dry matter percentage of leaf. Analysis of variance of data and mean comparison of them was done using MSTATC program. Mean comparison was done using Duncan's Multiple Range Test, at 5% probability level.

RESULTS AND DISCUSSION

According to variance analyses results (Table 1) of studied traits was observed that there was significant difference between the experimental conditions (test solution) in terms of dry matter percentage of stem at 1% level and in terms of dry matter percentage of leaf at 5% level. This could indicate greater accumulation of dry matter. According to Shahryari et al(2009) this means that under study genotypes had the same responses to potassium humate.

Jafari and et al (2012) reported that there is a significant difference between percent dry matter of total plant and dry weight of grains per ear at probability level of 1% in experimental conditions. Also, there was a significant difference between studied genotypes based on dry matter leaves and dry matter shoot at probability level of 1% and between percent dry matter of total plant at probability level of 5%.

The results of the comparison data (Table 2) on the experimental conditions (test solution) showed the liquid Humic fertilizer based on Leonardite, in terms of traits such as dry matter percentage of stem and dry matter percentage of leaf and respectively, with average of 48.94 and 54.58 had the greatest percentage, and normal condition with average of 35.59 and 37.05 had the lowest percentage of stem dry matter and dry matter of leaf and there was no difference between normal conditions and liquid Humic fertilizer based on pit in terms of dry mater of leaf and they placed in one group.

Jafari and et al (2012) reported that the applying humic fertilizer based on leonardite with a mean of 22.43 percent had the highest percent dry matter of total plant and with peat based humic fertilizer formed a group and showed no differences in the studied traits. Applying humic fertilizer based on leonardite with a mean of 37.73gr had the lowest dry matter leaves among the conditions being studied, whereas under the condition of without the application of humic fertilizer with a mean of 40.93gr highest value was obtained.

Table 1. Analysis of variance of evaluated traits under various experimental conditions

Source of Variations	df	Mean Square	
		Dry matter percentage of stem	Dry matter percentage of leaf
Replication	2	47.99*	1.96^{ns}
Experimental conditions (E.C.)	2	231.37**	140.29*
Error 1	4	3.21	11.24
CV (%)		3.93	8.09

* and **: Significant at p < 0.05 and < 0.01, respectively

Table 3. mean comparison of traits being studied for various experimental conditions

Experimental conditions	Characters	
	Dry matter percentage of stem	Dry matter percentage of leaf
without the application of humic fertilizer	37.05 c	35.591 b
peat based humic fertilizer	44.83 b	39.69 b
leonardite based humic fertilizer	54.58 a	48.94 a

Differences between averages of each column which have common characters are not significant at probability level of 5%.

CONCLUSION

The results showed that the use of Humic liquid fertilizers as organic fertilizers, can have a positive impact on dry matter in maize.

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