Comparison effect organic humic fertilizers the dry matter maize genotypes in Ardabil region

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Abstract: The use of biological products for feed grains is one of the solutions in achieving the goals of organic production is considered. In order to study the response of maize genotypes to use two types of liquid humic fertilizer based Peat and leonardite, were conducted a experiment split plot on the basis of completely randomized block design in three replicated in Agricultural Research Station of Islamic Azad University, Ardabil branch in 2010.In this experiment main-plots contain of three conditions (peat based humic fertilizer; leonardite based humic fertilizer; without the application of humic fertilizer) and the sub-plots were contain of six maize genotypes. Results showed that between experimental conditions view of percent dry matter of total plant and dry weight of grains per ear there are significant differences in 1 percent probability level. Results from mean comparison of data for experimental conditions (experimental solution) being studied application of application of leonardite based liquid humic fertilizer produced the dry weight of grains per ear (50.13 gr on average) among the conditions being studied, whereas under the condition of without humic fertilizer obtained the lowest value(28.59 gr).

[Maryam Jafari, Ali Mohammadpour Khanghah, Yousef Alaei, Seyed Sajjad Moosavi and Elena Khabiri. **Comparison effect organic humic fertilizers the dry matter maize genotypes in Ardabil region.** *Life Sci J* 2012;9(4):2746-2749]. (ISSN: 1097-8135). http://www.lifesciencesite.com. 404

Key word : Organic humic 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).

The use of biological products for feed grains is one of the solutions in achieving the goals of organic production is considered. Humic substances (HS) are the result of organic decomposition and they are the natural organic compounds which comprise 50 to 90 % of the organic matter of peat, lignites, sapropels, as well as of the non- living organic matter of soil and water ecosystems. These substances are the source of the humates used in agriculture. According to the classical definition, HS are “a general category of naturally occurring heterogeneous organic substances that can generally be characterized as being yellow to black color, of high molecular weight and are refractory” (Kulikova et al., 2005).

Gadimov et al (2009) claimed that humic substances are natural technological products with a miraculous biological effect on crops and concluded that a scientific and practical program is required to make use of this technology in the world, particularly in developing countries.

Materials and Method:

In order to study the response of maize genotypes against the application of peat and leonardite based liquid humic fertilizer an experiment was conducted at experimental field of Islamic Azad University, Ardabil Branch (5 km west of Ardabil City) in 2010. 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.

Vegetative material included 6 maize genotypes prepared from Agriculture and Natural Resources Research Center of Ardabil Province. The Experiment was conducted as Split Plot in the form of randomized complete block design with three replications. The main factor included three conditions (peat based humic fertilizer; leonardite based humic fertilizer; without the application of humic fertilizer) and the sub factor included 6 maize genotypes (ZP677, Golden west, OS499, ZP434, Ns540 and Single Cross 704). 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 of 220mL 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 400mL 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 percent dry matter of total plant, dry weight of grains per ear, dry matter leaves and dry matter shoot.

Analysis of variance of data and mean comparison of them was done using SAS program. Mean comparison was done using Duncan's Multiple Range Test, at 5% probability level.

Results and Discussion

Considering the ANOVA results (Table 1) in studied traits, it was observed 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%. This indicates the genetic diversity between genotypes to choose the desired traits. Furthermore, there was no difference observed between the interaction of genotype and experimental conditions for any trait being studied.

Shahryari et al. (2011) studied the response of various maize genotypes against chlorophyll content of the leaves at the presence of the two types of humic fertilizers. In their experiment, solutions (two types of peat and leonardite based liquid humic fertilizers and control) and interaction of "genotypes × solutions" produced significant difference at 1% probability level in terms of chlorophyll content of the leaves.

Results to data mean comparison (Table 2) on studied genotypes indicated that ZP 677 genotype with a mean of 268.4gr had the highest dry matter shoot while ZP 434 genotype with a mean of 148.8gr had the lowest dry matter shoot. ZP 677 and Single Cross 704 genotypes formed one group and showed no differences in the studied traits. ZP 677 genotype with a mean of 43gr had the highest dry matter leaves and ZP 434 genotype with a mean of 33.06gr had the lowest dry matter leaves. ZP 677, Single Cross 704 and NS 540 genotypes formed a group and showed no differences in the studied traits. Based on percent dry matter of total plant among the studied genotypes, ZP 434 with a mean of 22.18 percent was the best genotype and ZP 677 genotype with a mean of 19.02 percent was the lowest studied genotype. OS 499 ad Single Cross 704 genotypes formed a groups and showed no differences in the studied traits.

Results to data mean comparison (Table 3) in experimental conditions suggested that 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. While without the application of humic fertilizer with a mean of 18.35 percent had the lowest percent dry matter of total plant. 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. Based dry weight of grains per ear among the studied conditions, applying humic fertilizer based on leonardite with a mean of 50.13gr was the best conditions and without the application of humic fertilizer with a mean of 28.59gr was the lowest studied conditions.

Shahryari et al (2009) found that Potassium Humate increased wheat yield from 2.49 to 3.61 ton/ha under normal irrigation condition. They concluded that Potassium Humate is a miraculous natural material for increasing both quantity and quality of wheat and can be used to produce organic

wheat. Thus, application of biological products such as humic fertilizers to provide nutrition for crops can be one of the useful methods to achieve some of the objects of organic crop production.

Mohammadpourkhaneghah et al(2012) reported that the application of leonardite based humic fertilizer increased biological yield by 46.89% compared to control, whereas peat based humic fertilizer increased biological yield by 34.47% compared to control.

Conclusion

The results showed that the use of liquid humic fertilizers as organic fertilizers, can have a positive impact on maize dry matter. Humic acid can reduce the use of chemical fertilizers has been reduced environmental pollution, and also due to lower consumption of these fertilizers has resulted in lower costs.

Table 1. Analysis of variance of evaluated traits under various experimental conditions for 3 maize genotypes

Source of Variations	df	Mean Square			
		Dry matter leaves	Percent dry matter of total plant	Dry matter shoot	Dry weight of grains per ear
Replication	2	111.02	3.51	6029.88	421.26
Experimental conditions (E.C.)	2	55.13 ^{ns}	75.45**	1522.72 ^{ns}	2088.57**
Error 1	4	10.59	3.89	773.97	25.79
Genotype (G)	5	147.76**	15.31*	17154.60**	46.91 ^{ns}
G × E. C.	10	7.06 ^{ns}	5.12 ^{ns}	667.18 ^{ns}	33.02 ^{ns}
Error 2	30	21.46	5.59	2104.94	48.41
CV (%)		11.90	11.52	21.68	17.70

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

Table 2. Mean comparison of traits being studied for maize genotypes

Genotypes	Characters		
	Dry matter leaves (gr per plant)	Percent dry matter of total plant	Dry matter shoot (gr per plant)
OS 499	35.01 bc	19.82 abc	189.2 bc
ZP 677	43.00 a	19.02 c	268.4 a
Golden West	39.44 ab	21.99 ab	190.9 bc
ZP 434	33.06 c	22.18 a	148.8 c
Single Cross 704	40.44 a	20.56 abc	246.3 a
NS 540	42.55 a	19.60	226.1 ab

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

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

Experimental conditions	Characters		
	Dry matter leaves (gr per plant)	Percent dry matter of total plant	Dry weight of grains per ear (gr)
without the application of humic fertilizer	40.93 a	18.35 b	28.59 c
peat based humic fertilizer	38.10 ab	20.81 a	39.15 b
leonardite based humic fertilizer	37.73 b	22.43 a	50.13 a

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

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11/14/2012