International Journal of Farming and Allied Sciences
Available online at www.ijfas.com
©2013 IJFAS Journal-2013-2-10/242-244
ISSN 2322-4134 ©2013 IJFAS

Effects of liquid humic acid fertilizer on the physiological characteristics proportion in single cross maize cultivar

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 substances comprise a major part of organic matter, and their influence on soil properties is well known and could be used to improve microbial activity. Maize is one of the most highly consumed crops, and the most important foodstuff after wheat and rice around the world. 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 the all traits at 1% level.The results of the comparison data on the experimental conditions (test solutions) showed the liquid Humic fertilizer based on Leonardite, in terms of traits such as ratio of peduncle length to plant height, the ratio of pre-terminal internodes length to plant height and the ratio of other internodes length to plant height respectively with average of 0.09, 0.05 and 0.34 were the lowest but was the best condition.

***Keywords*:** Humic liquid fertilizer, Maize, Physiological traits ratio

INTRODUCTION

Humic substances comprise a major part of organic matter, and their influence on soil properties is well known and could be used to improve microbial activity. In addition, humic substances can directly affect root growth (Nardi et al. 2009), especially lateral root emergence and proliferation of root mitotic sites (Canellas et al. 2002). A mechanism for humic substance stimulation of root growth was proposed based on the classical acid growth theory, describing an auxin-like induction of protein synthesis and activation of the plasma membrane (PM) H+-ATPase in maize roots (Canellas et al. 2002; Zandonadi et al. 2007).Humic substances (HS) are the result of organic decomposition of the natural organic compounds comprising 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. Authors believe that humic substances can be useful for living creatures in developing organisms (as substrate material or food source, or by enzyme-like activity); as carrier of nutrition; as catalysts of biochemical reactions; and in antioxidant activity (Kulikova et al., 2005). Yang et al. (2004) argued that humic substances can both directly and indirectly affect the physiological processes of plant growth. Soil organic matter is one of the important indices of soil fertility, since it interacts with many other components of the soil. Soil organic matter is a key component of land ecosystems and it is associated with the basic ecosystem processes for yield and structure (Pizzeghello etal., 2001).Classically, humic substances are defined as a general group of heterogeneous organic materials which occur naturally and are characterized by yellow through dark colors with high molecular weight (Kulikova et al., 2005). Shahryari et al. (2011) experienced the effect of two types of humic fertilizers (peat and leonardite derived) on germination and seedling growth of maize genotypes. They reported that interaction of "genotype × solutions (peat and leonardite

based humic fertilizers and control) was significant in terms of the length of primary roots. Application of leonardite based humic fertilizer had a remarkably more effect on relative root growth of Single Cross 794 and ZP 434 than other genotypes. In their experiment, the relation between germination rate and primary roots was positively significant under the condition of application of both types of humic fertilizers; but there was not the same relation for control treatment. They argued that all types of various humic substances as a biological fertilizer can have an either similar or different effect in early growth stages of maize, as peat and leonardite based fertilizers that they applied produced more seedling roots than control, however the length of coleoptiles was higher in treatment with application of leonardite based humic fertilizer and control than treatment with application of peat based humic fertilizer. They believe that if used in lower quantity these natural fertilizers can have a lot of effect on plant growth. Hence, in order to recognize how effective they might be, investigations should be considered based on various amounts of humic fertilizers. Finally, they suggested that both peat and leonardite based humic fertilizers could be used to stimulate growth of primary roots in maize which are critical for an optimal establishment of maize in the field.

The following research tries to compare the humic liquid fertilizer effects on physiological traits ratio 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 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 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 ratio of peduncle length to plant height, ratio of pre-terminal internodes length to plant height and ratio of other internodes length to plant height. 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 the all traits at 1% level.
Mohammadpour khaneghah et al (2012) reported that there was a significant difference between experimental conditions in terms of grain yield and biological yield at 1 and 5% probability levels.

The results of the comparison data (Table 2) on the experimental conditions (test solutions) showed the liquid Humic fertilizer based on Leonardite, in terms of traits such as ratio of peduncle length to plant height, the ratio of pre-terminal internodes length to plant height and the ratio of other internodes length to plant height respectively with average of 0.09, 0.05 and 0.34 were the lowest traits and normal conditions won the greatest traits such as the ratio of peduncle length to plant height, the ratio of pre-terminal internodes length to plant height and the ratio of other internodes length to plant height respectively with average of 0.15, 0.08 and 0.54. Whatever these traits are less will be better at harvest, so, liquid humic fertilizer based on Leonardite was the best conditions.

Ayas and Gulser (2005) reported that humic acid leads to increased growth and height and subsequently increased biological yield through increasing nitrogen content of the plant. It has also been reported that application of humic acid in nutritional solution led to increased content of nitrogen within aerial parts and growth of shoots and

root of maize (Tan, 2003). In another investigation, the application of humic acid led to increased phosphorus and nitrogen content of bent grass plant and increased the accumulation of dry materials (Mackowiak et al., 2001).

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

Source of Variations	df	Mean Square		
		Ratio of peduncle length to plant height	Ratio of pre-terminal internodes length to plant height	Ratio of other internodes length to plant height
Replication	2	0.00014*	0.00007*	0.0003^{ns}
Experimental conditions (E.C.)	2	0.0022**	0.0008**	0.031**
Error 1	4	0.00001	0.00001	0.00026
CV (%)		2.75	4.84	3.69

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

Table 2. mean comparison of traits being studied for various experimental conditions

Experimental conditions	Characters		
	Ratio of peduncle length to plant height	Ratio of pre-terminal internodes length to plant height	Ratio of other internodes length to plant height
without the application of humic fertilizer	0.15 a	0.08 a	0.54 a
peat based humic fertilizer	0.11 b	0.06 b	0.42 b
leonardite based humic fertilizer	0.09 c	0.05 c	0.34 c

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 physiological traits ratio.

REFERENCES

Ayas, H., and F. Gulser. 2005. The effect of sulfur and humic acid on yield components and macronutrient contents of spinach. *J. biol. Sci* 5 (6): 801- 804.

Canellas LP, Olivares FL, Okorokova-Façanha AL, Façanha AR. 2002. Humic acids isolated from earthworm compost enhance root elongation, lateral root emergence, and plasma membrane H+-ATPase activity in maize roots. Plant Physiol 130:1951–1957.

Kulikova NA, Stepanova EV, Koroleva OV. 2005. Mitigating activity of humic substances: direct influence on biota. In: I.V. Perminova et al. (ed.). Use of humic substances to remediate polluted environments: from theory to practice. Springer Netherlands. 52: 285-309.

Mackowiak., CL, P.R. Grossl., and B.G. Bugbee. 2001. Beneficial effects of humic acid on micronutrient availability to wheat. *Soil Science Soc. Am. J.* 65:1744-1750.

Mohammadpourkhanghah, A., Shahryari, R., Alaei, Y. and Shahmoradmoghanlou, B. 2012. Comparison of the effect of liquid humic fertilizers on yield of maize genotypes in Ardabil region. African Journal of Biotechnology Vol. 11(21), pp. 4810-4814.

Nardi S, Carletti P, Pizzeghello D, Muscolo A. 2009. Biological activities of humic substances. In: Senesi N, Xing B, Huang PM (eds) Biophysico-chemical processes involving natural nonliving organic matter in environmental systems. Vol 2, part 1. Fundamentals and impact of mineral-organicbiota interactions on the formation, transformation, turnover, and storage of natural nonliving organic matter (NOM). Wiley, Hoboken, pp 305–339.

Pizzeghello D, Nicolini G, Nardi S. 2001). Hormone-like activity of humic substances in Fagus sylvaticae forests. New Phytologist. 151: 647-657.

Shahryari R, Khayatnezhad M, Bahari N. 2011. Effect of two humic fertilizers on germination and seedling growth of maize genotypes. Adv. Environ. Biol. 5(1): 114-117.

Tan, K.H. 2003. Humic Matter in Soil and the Environment. Marcel Dekker. New York.

Yang CM, Wang MH, Lu YF, Chang IF, Chou CH. 2004. Humic substances affect the activity of chlorophyllase. J. Chem. Ecol. 30(5): 1057-1065.

Zandonadi DB, Canellas LP, Façanha AR. 2007. Indolacetic and humic acids induce lateral root development through a concerted plasmalemma and tonoplast H+ pumps activation. Planta 225:1583–1595.