Journal of Novel Applied Sciences
Available online at www.jnasci.org
©2013 JNAS Journal-2013-2-1/144-147
ISSN 2322-5149 ©2013 JNAS

Study on the Effect of humic acid fertilizer on the amount of water loss in the single cross maize cultivar

Seyed Sajjad Moosavi*, Yousef Alaei, Ali Mohammadpour khanghah, Mohammad Mohammadpour khanghah and Maryam Jafari

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

Corresponding author Email : moosavi_sajjad@yahoo.com

ABSTRACT: Humic substances (HS) are the components of organic decomposition and they are the natural organic compounds which comprise 50 to 90 % of the organic matter of peat, lignites and sapropels, as well as of the non- living organic matter of soil and water ecosystems. 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 (with the application of 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 water waste of stem, Humic liquid fertilizers based on Leonardite with an average of 0.35 between studied conditions were the best conditions. Normal condition and the liquid humic fertilizer based on pit respectively with an average of 0.59 and 0.52 were in the next rank.

***Keywords*:** Humic liquid fertilizer, Maize, Water waste.

INTRODUCTION

Humic substances (HS) are the components of organic decomposition and they are the natural organic compounds which comprise 50 to 90 % of the organic matter of peat, lignites and 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 with high molecular weight and they are refractory” (Kulikova et al. 2005). Yang et al(2004) has stated that the humic materials can affect physiological processes of plant growth directly and indirectly. Their direct effects include increase in cell membrane permeability, respiration, nucleic acid biosynthesis, ion uptake, enzyme activity and sub-enzyme activity. The biological activity of HS encompasses all activities of HS in regulating plant biochemical and physiological processes, irrespective of their stimulatory or inhibitory roles. 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 et al, 2001).

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 (with the application of 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 water waste of leaves, water waste of stem and water waste of ear. 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) in studied traits was observed that there was significant difference between the experimental conditions (test solution) in terms the all traits at 1% level and this could indicate greater accumulation of dry matter.

The results of the comparison data (Table 2) on the experimental conditions (test solutions) showed the liquid humic fertilizer based on Leonardite, won the lowest water waste of leaves and the water waste of corn, respectively, with an average of 0.37 and 0.49 and normal conditions respectively with average of 0.59 and 0.67 won the greatest water waste of leaves and the water waste of corn. Whatever dry matter is more, less water will be lost. So, the humic liquid fertilizer was best condition. The water waste of stem, Humic liquid fertilizers based on Leonardite with an average of 0.35 between studied conditions were the best conditions. Normal condition and the liquid humic fertilizer based on pit respectively with an average of 0.59 and 0.52 were in the next rank.

Ayas and Gulser (2005) reported that humic acid caused to increase growth and height and subsequently increase biological yield through increasing nitrogen content of the plant. It has 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). Humic acid leads to increased plant yield through positive physiological effects such as impact on metabolism of plant cells and, increasing the concentration of leaf chlorophyll (Naderi et al. 2002). Also, spraying humic acid on wheat crop increased its yield by 24 % (Delfine et al. 2002).

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

Source of Variations	df	Mean Square		
		water waste of leaves	water waste of stem	water waste of ear
Replication	2	0.002 ^{ns}	0.004 ^{ns}	0.015**
Experimental conditions (E.C.)	2	0.036**	0.46 **	0.024**
Error 1	4	0.0013	0.0011	0.00028
CV (%)		7.46	6.99	2.87

* 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		
	water waste of leaves	water waste of stem	water waste of ear
without the application of humic fertilizer	0.59 a	0.59 a	0.67 a
peat based humic fertilizer	0.48 b	0.52 b	0.58 b
leonardite based humic fertilizer	0.37 c	0.35 b	0.49 c

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

REFERENCES

Amal A. A. 2006. Preparation, Characterization and Evaluation of Anionic Starch Derivatives as Flocculants and for Metal Removal, Starch/ Stärke, 58, 391–400.

Clough, R. L. 2001. High-energy radiation and polymers: A review of commercial processes and emerging applications, Nuclear Instruments and Methods in Physics Research Section B: Beam Interactions with Materials and Atoms, 185, (1–4), 8–33.

Huq, T., Khan, A. , Dussault, D. , Salmieri, St. , Khan, R. A. , Lacroix, M. 2012. Effect of gamma radiation on the physico-chemical properties of alginate-based films and beads, Radiation Physics and Chemistry, 81, 8, 945–948.

Khalil, M. I., Mostafa, Kh. M. and Hebeish, A. 1993. Graft polymerization of acrylamide onto maize starch using potassium persulfate as initiator, Die Angewandte Macromolecular Chemie; 213, 14.

Karmakar, G. P., Singh, R. P. 1998. Flocculation studies using amylase - grafted polyacrylamide, Colloids Surf. A, 733, 119-124.

Khalil, M. I., Amal A. A. 2001. Preparation and Evaluation of Some Cationic Starch Derivatives as Flocculants, Starch/ Stärke, 53, 84–89.

Kiatkamjornwonga, S., Chomsaksakulb W., Sonsukc, M. 2000. Radiation modification of water absorption of cassava starch by acrylic acid/acrylamide, Radiation Physics and Chemistry, 59, 4, 413–427.

Mostafa, Kh. M. and El-Sanabary, A. A. 2012. Harnessing of Novel Tailored Modified Pregelled Starch Derived Products in Sizing of Cotton Textiles, Advances in Polymer Technology, Vol. 31, No. 1, 52–62.

Mostafa, Kh. M., Samarkandy, A. R. and El-Sanabary, A. A. 2011. Grafting onto Carbohydrate Polymer Using Novel Potassium Persulphate/Tetramethylethylene Diamine Redox System for Initiating Grafting, Advances in Polymer Technology, Vol. 30, No. 2, 138 –149.

Mostafa, Kh. M. 1995. Graft polymerization of acrylic acid onto starch using potassium permanganate acid (redox system), Journal of Appl. Polymer Sci., 56, 263-269.

Mostafa, Kh.M. and Samerkandy A. R. 2005. Synthesis of New Polymeric Composite Materials and its Application in sizing of Cotton Textiles, Research Journal of applied Sciences, 1 (5), 353-340.

Mostafa, Kh.M. and Samerkandy A. R. and El- Sanabary, A. A. 2009. Using Persulfate Oxidized Chitosan as a Novel Additives in Easy-Care Finishing for Cotton Textiles, Polymer Plastic Technology & Engineering, 48, 2,130-135.

Mostafa, Kh. M. and El- Sanabary, A. A. Synthesis and Characterization of Novel Smart Flocculant Based on Poly (MAam) – Pregelled Starch Graft Copolymers and Their Degraded Products. Advances in Polymer Technology, accepted for publication.

Mostafa, Kh.M. El- Sanabary, A. A. and Samerkandy A. R. 2007. Modification of carbohydrate polymers: Part2: Grafting of Methacrylamide onto Pregelled Starch Using Vanadium-mercaptosuccinic acid redox pair, Journal of Applied Science Research, 3 (8), 641- 647 2007.

Mostafa, Kh. M. 2005. Grafting of Methacrylamide onto Cotton Yarn" Part 1: Tensile Strength, Journal of applied science, 5 (2), 341-346 2005.

Mostafa, Kh.M. and Samerkandy A. R. and El- Sanabary, A. A. 2010. Synthesis and characterization of (poly (N-vinyl Formamide) - Pregelled Starch-graft copolymer. Kh. M.Mostafa, Abdul Rahim Samarkandy and A.A.El-Sanabary, Journal of Polymer research, 17, 789 - 800.

Mostafa, Kh. M. and Morsy, M.S. 2004. Modification of Carbohydrate Polymers via Grafting of Methacrylonitrile onto Pregelled Starch using Potassium Monopersulphate /Fe2+ Redox Pair, Polymer International, 53, 7, 885-890.

Mostafa, Kh.M. and Samerkandy A. R. and El- Sanabary, A. A. 2011. Grafting onto Carbohydrate Polymer Using Novel Potassium Persulphate/Tetramethylethylene Diamine Redox System for Initiating Grafting, Advances in Polymer Technology, 30, 2, 138–149.

Mubarak, A. K., Bhattachariaa, S. K., Kaderb M. A., Baharic, K. 2006. Preparation and characterization of ultra violet (UV) radiation cured bio-degradable films of sago starch/PVA blend, Carbohydrate Polymers, 63, 4, 18, 500–506.

Nikolic, V., Velickovic, S., Popovic, A. 2012. Amine activators influence on grafting reaction between methacrylic acid and starch, Carbohydrate Polymers, 88, 4, 1407–1413.

Sen G., Kumar, R., Kumar, S., Pal, S. 2009. A novel polymeric flocculants based on polyacrylamide grafted carboxymethylstarch, Carbohydrate Polymer, 77, 822–831.

Sen, G., Pal, S. 2009. Microwave initiated synthesis of polyacrylamide grafted carboxymethylstarch (CMS-g-PAM): Application as a novel matrix for sustained drug release, International journal of biological macromolecules, 45, 48–55.

Sen, G., Kumar, R., Ghosh, S., Pal, S. 2009. A novel polymeric flocculant based on polyacrylamide grafted carboxymethylstarch, Carbohydrate Polymers, 77, 4, 19, 822–831.

Singha, V., Kumara, P. Sanghib, R. 2012. Use of microwave irradiation in the grafting modification of the polysaccharides – A review, Progress in Polymer Science, 37, 2, 340–364.

Vahdat, A., Bahrami, H., Ansari, N., Ziai, F. 2007. Radiation grafting of styrene onto polypropylene fibres by a 10 MeV electron beam, Phys. Chem. 76, 787–793.
Vandana Singha, Devendra Narayan Tripathia, Ashutosh Tiwaria, Rashmi Sanghib (2006). Microwave synthesized chitosan-graft-poly(methylmethacrylate): An efficient Zn2+ ion binder, Carbohydrate Polymers, 65, 1, 10, 35–41.
Vogel, A. I. 1975. Elementary Practical Organic Chemistry, 2nd ed.; Longman: London, Part 3, p 652).
Wang, J. P., Chen, Y. Z., Zhang, S. J., Yu, H. Q. 2008. A chitosan - based flocculant prepared with gamma-irradiation-induced grafting, Bioresour. Technol. 99, 3397–3402.
Zhang X, Liu Z. 2012. Recent advances in microwave initiated synthesis of nanocarbon materials, Nanoscale, 4 (3) 707-714.