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Response of two broccoli cultivars to foliar application of Lithovit fertilizer under two planting methods.

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ABSTRACT:

A field experiment was conducted in Agriculture Faculty Farm, El-Azhar University, Assiut Branch in 2010-2011 and 2011-2012 seasons to study the effect of foliar Lithovit fertilization at different doses on yield and growth of two broccoli cultivars using two planting methods. Randomized Complete Blocks Design (RCBD) in split-spilt-plot arrangements with three replicates was used. The two planting methods (direct sowing and transplants) occupied the main plots. While, the Broccoli cultivars (Calabrese and Waltham 29) were arranged in the sub- plots. The Lithovit levels were; 0% (control), 0.05%, 0.10 % and 0.20 %.These concentrations were distributed in the sub- sub-plots. The obtained results revealed that planting method affected significantly most of the studied traits. But insignificant differences were detected for number of branches/plant in both seasons and No. of curds/plant, main head weight and total head yield (ton/feddan) in the first season. Most of studied traits reacted significantly to transplanting method except plant height. The tallest plants were obtained from direct seed sowing method. Also, Broccoli cultivars varied significantly in all studied traits except plant height in the first season and number of days from planting to heading in both seasons. Here too, Calabrese cultivar surpassed Waltham 29 in all studied traits except number of branches /plant in both seasons. The foliar application of Lithovit enhanced significantly plant height, main head length, main head diameter, main head weight and total head yield (ton/feddan) in favor of 0.05% concentration in the two growing seasons. The highest broccoli yield was obtained from Calabrese cultivar planted with direct seeds and subjected to 0.05% Lithovit as foliar application. Also, transplanting the same cultivar without using Lithovit fertilizer gave better growth and higher yield.

Keywords: Broccoli, Foliar application, Lithovit; yield, Branching,Number of curds/plant.

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Introduction:

Broccoli (*Brassica oleracea* L.var. *italica*) belongs to family Brassicacea that comprises a number of cole vegetable crops including cabbage, cauliflower, chinese cabbage, brussels sprouts and kohlrabi. Broccoli has enormous nutritional and medicinal values due to its high contents of vitamins (A, B1, B2, B5, B6 and E), minerals (Ca, Mg, Zn and Fe) and antioxidant substances which prevent the formation of cancer causing agents (Beecher, 1994 and Abou El- Magd *et al.*2006). Broccoli is widely cultivated in many European and American countries. In Egypt, broccoli is grown in a very scattered areas and the total cultivated area is not presisly known. (Kunicki 2004) found that, in Poland, broccoli is cultivated from transplants produced under tunnels or in seedbeds. Also, direct sowing cultivation, recommended in the USA, makes it possible to increase plant density, and to produce a greater yield. This method is also cheaper than transplanting, but the latter intensifies the use of growing area.

Macro and micro nutrients are crucial in crop nutrition for achieving higher yields(Raun and Johnson,1999;Parvez *et al.*, 2009).

Lithovit is CO_2 foliar fertilizer that can be used successfully outdoors as well as indoors (zeovita GmbH, 2007).

The basic material for Lithovit is a calcareous rock consisting essentially of limestone calcium carbonate (Ca_2Co_3). In addition , it contains smaller productions of silica (SiO_2) ,dolomite(calcium-magnesium carbonate ($CaMg(Co_3)_2$), iron oxide (Fe_2O_3) , manganese (Mn), zinc (Zn), copper (Cu) and cobalt (Co) (Lefo institut, 2006).

Lithovit fertilizer consists of Calcium - Magnesium Carbonate $(Ca,Mg)CO_3$, supplemented by numerous important micro-nutrients. It is produced by milling natural limestone in special mills down to particle diameter < 10μ.The aqueous suspension (0.5%)of this fertilizer is very fine tribodynamic activated powder. On the foliage, the Lithovit particles penetrate in part directly through the stomata of the leaves into the intercellular compartments. The rest remains on the leaves as a film. Although, Lithovit acts as an excellent fertilizer, the mechanism of its action is still not totally clear. Most likely, it is due to supplying the plants with Carbon dioxide (CO_2) in much higher concentration than that in the atmosphere and so enabling the photosynthesis to take place with higher degree leading to a stronger natural growth and, consequently, increased yield. Furthermore, the supplements of micro-nutrients increase the enzymatic activity that plays a role in this process. The release of CO_2 from the Lithovit remaining on the leaves surface is probably due to its transformation to $(Ca,Mg)(HCO_3)_2$ during the night by means of CO_2 (produced by the plants in addition to that in

the atmosphere) and H_2O (which covers the leaves as dew in addition to that produced by the plants). During the day the temperature rises gradually, water evaporation occurs and the $(Ca,Mg)(HCO_3)_2$ is back transformed to Lithovit giving CO_2 on high concentration directly in the leaves surface. In that way Lithovit acts as quasi permanent catalytic depot (Bilal, 2010).

The interest in foliar fertilizers arose due to its multiple advantages such as rapid and efficient response to the plant, less product needed, and independence on soil conditions. It is also recognized that supplementary foliar fertilization during crop growth can improve the mineral status of plants and increase the crop yield (Kolota and Osinska, 2001). The absorption rate of mineral nutrients by aboveground plant parts considerably differs not only among plant species but also among varieties within the same species (Wojcik, 2004).

There is little information on the effect of the foliar application of Lithovit fertilizer on broccoli. Therefore, the main objective of this work was to study the effect of Lithovit fertilization at different doses and two planting methods on the growth and yield of two broccoli cultivars.

Materials and methods:

A field experiment was layout in Agriculture Faculty Research Farm of El-Azhar University- Assiut branch in 2010-2011 and 2011-2012 seasons to study the effect of Lithovit foliar fertilization utilized at different doses on broccoli growth and yield under two planting methods. Randomized Complete Blocks Design (RCBD) in split-spilt-plot arrangement with three replicates was used. The two planting methods (direct seeding and transplanting) were distributed in main plots while the Broccoli cultivars(Calabrese and Waltham 29) were arranged in sub plots. Also, the Lithovit levels were; 0%(control plots were sprayed with distilled water), 0.05%, 0.10 % and 0.20%). These levels were distributed in sub-sub plots. The seeds of previous cultivars were planting in 10^{th} October in both seasons (direct seeding) and the transplanting were planted in the nursery in 1^{st} September and transplanted in the same time (10^{th} October) in both seasons. The sub-sub-plot was four rows 3.5 m long with 70cm apart. The distance between plants within each row was 50 cm. The Lithovit spray was done three times. For direct seed method, the spray was 21, 36 and 51 days after sowing. For transplanting method, the spray was after one, two and four weeks. The Lithovit was obtained from Agrolink Company as a powder .This powder was dissolved at rate of 0.5 g, 1g and 2 g per litter

of distilled water. All other cultural practices were carried out as recommended for broccoli production. Ten guarded plants were randomly taken from each sub-sub-plot and the following measurement were recorded plant height (cm),number of branches per plant , number of days from planting to heading, number of curds per plant , main head length, main head diameter, main head weight (g) and total head yield (ton per feddan) .

All data collected were statistically analyzed with analysis of variance (ANOVA) procedure using the MSTAT-C Statistical Software Package (Michigan State University, (1983). Differences between means were compared by LSD test at 5% level of significant and differences between the control and the other Lithovit treatments were compared by t Dunnet test at 5% level of significant (Gomez and Gomez, 1984).

Results and Discussion:

Vegetative traits:

The data presented in Table (1) reveal that direct seeds sowing surpassed significantly transplanting method and gave the tallest plants (96.500 and 97.050 cm in the first and second seasons, respectively). Also, the data show significant effect of cultivars on plant height in the second season only. Calabrese cultivar surpassed Waltham 29 in this respect (93.433cm). This may be due to the interaction between genetic and environmental condition which was suitable for Calabrese cultivar than Waltham 29. Some investigators confirmed the differences among broccoli cultivars on their vegetative growth characteristics. (Butt *et al*., 1988; Liu and Shelp, 1993; MeCall *et al*., 1996 ; Sanchez *et al*., 1996; Rekowska , 1999; Aboul-Nasr and Ragab, 2000; Real Rosas *et al*., 2002; Abou El-Magd *et al*., 2005; Abou El-Magd *et al*., 2006; Mostafa, 2006 ;Abou El-Magd *et al*., 2010; and Hanaa *et al*., 2010.

Also, the data show that Lithovit fertilizer had a significant effect on plant height in the two growing seasons as compared to control (untreated).All Lithovit concentration surpassed significantly untreated plant (control) in this respect. The tallest plants (94.733 and 96.000 cm in first and second seasons, respectively) were obtained from plant treated with 0.05% Lithovit. But, the control treatment registered the shortest plants (85.333 and 88.383 cm in first and second seasons, respectively). Here too, the second order interaction had a significant influence in this respect. The data show that the tallest plants (100.467 and 100.400 cm in the first and second seasons, respectively) were obtained from Waltham 29 cultivar when planting was done by direct seeds and subjected to 0.05% Lithovit.

Concerning number of branches per plant the data illustrated in Table (2) reveal that

effect of planting methods were not significant in both seasons. But, cultivars had a significant effect on this trait in the two growing seasons. Waltham 29 cultivar produced the highest values (14.575 and 15.150 branch per plant in the first and second seasons, respectively). Here too; the illustrated data in Table (2) reveal that Lithovit application had a significant effect in number of branches per plant in the second season only. Foliar application with 0.20% Lithovit gained the highest number of branches per plant (15.283 branches per plant). Also, the first order interaction between sowing methods and cultivars had a significant effect on number of branches per plant in the second season only whereas transplanting x Waltham 29 gave the highest number (15.383). Moreover, the first order interactions between cultivars and Lithovit had a significant influence in this respect in both seasons. The highest values of branches number per plant (16.033 and 17.067 in the first and second seasons, respectively) were obtained from 0.20% Lithovit and Waltham 29 cultivar. Here too, the first order interaction between Lithovit and planting method had a significant influence on number of branches per plant in the two growing seasons. The highest values (15.200 and 15.333 in the first and second seasons, respectively) were obtained from application 0.05% and 0.20% Lithovit in first and second seasons, respectively on transplanted plots.

Number of days from planting to heading:

The illustrated data in Table (3) show that planting method affected significantly number of days from planting to heading in the two growing seasons. Using transplanting method in planting gave the earlier plants (82.442 and 82.808 days in first and second seasons, respectively) as compared to direct seed method. Data exhibited in Table (3) reveal that the cultivars effect was not significant in both seasons. Also, Lithovit application had a significant effect in this respect in both seasons. Foliar application of 0.20% Lithovit decreased the period from planting to heading to 79.017 and 79.533 days in first and second seasons, respectively. On the other hand, the longest period from planting to heading (90.467 and 90.833 days in the first and second seasons, respectively) was obtained from untreated plants (control). Moreover, the first order interactions between cultivars and Lithovit had a significant influence in both seasons. The shortest period from planting to heading (78.400 and 79.433 days in the first and second seasons, respectively) was obtained from 0.20% Lithovit treatment with Waltham 29 cultivar in the first season and Calabrese cultivar in the second season.

Number of curds /plant:

The data illustrated in Table (4) reveal that sowing method had a

significant effect in number of curds per plant in the second season only. Transplanting method produced the highest values of the number of curds /plant (13.042) as compared to direct seed method (11.592). Also, the presented data show the significant effect of cultivars in this respect in both seasons. The highest number of curds/plant (13.292 and 13.133 in the first and second seasons, respectively) was gained by Calabrese cultivar. Otherwise, the lowest values in this respect (11.042 and 11.500 curds /plant in the first and second seasons, respectively) were obtained from cultivar Waltham 29. The interaction between cultivars and Lithovit was significant in the two growing seasons. The highest numbers of curds /plant (14.433 and 14.000) were obtained from Calabrese cultivar under control treatment. Moreover, the data show that the second order interaction had a significant effect on number of curds /plant in the second season only. The highest value (14.267) in this respect was obtained from untreated Calabrese cultivar planted with transplanting method.

Main head length:

Data presented in Table (5) declare that sowing methods had a significant effect on main head length in both seasons. The longest heads (19.033 and 19.358 cm in the first and second seasons, respectively) were obtained from transplanting method. Also, the data emphasize that the cultivars had a highly significant effect on the main head length in the two growing seasons. The longest main heads (19.708 and 20.200 cm in the first and second seasons, respectively) were obtained from Calabrese cultivar. Moreover, the illustrated data show the significant influence of Lithovit application on main head length in both seasons. Foliar application by 0.05% Lithovit surpassed the other concentrations and control in this respect and produced the highest main head length (19.167 and 19.400 cm in the first and second seasons, respectively). The first order interaction between planting methods and Lithovit application was significant in both seasons. The longest values in this respect (19.900 and 20.200 cm in the first and second seasons, respectively) were obtained from transplanting method when plants treated with 0.05% Lithovit in the first season and in untreated plants in the second season.

Main head diameter:

The data in Table (6) state that planting methods had a significant effect on main head diameter in both seasons. The highest values (8.862 and 9.029 cm in the first and second seasons, respectively) were obtained from transplanting method. Transplanting may be the most successful technique to achieve a desired plant stand (Lewis et al., 1995**)**. Also, the data show that the cultivars studied had a highly significant influence on main head diameter in both seasons. Calabrese cultivar surpassed the

Waltham 29 in this respect and gave 10.546 and 10.710 cm in first and second season, respectively. Also, the illustrated data reveal that Lithovit application had a significant effect in the two growing seasons. The largest main head diameter (9.208 and 9.408 cm in the first and second seasons, respectively) was obtained from plants treated with 0.05% Lithovit. Here too, the first order interaction between planting methods and cultivars was significant in the first season only. The highest mean value (10.954 cm) was obtained from transplanting Calabrese plants. Also, the first order interaction between planting methods and Lithovit was significant in both seasons. The highest mean values (9.375 and 9.567 cm in the first and second seasons, respectively) in this trait were obtained from transplanting method untreated plants in the first season and from 0.05% Lithovit with direct seed sowing in the second season. Here too, the data show the significant effect of the first order interaction between cultivars and Lithovit in the first season only. The highest diameter (10.958 cm) was obtained from untreated Calabrese plants.

Main head weight (g):

The data in Table (7) show that planting methods had a significant effect on main head weight in the second season only. The highest value (372.917 g) was obtained from transplanting method. Also, the cultivars had a highly significant influence on this trait in both seasons. Calabrese cultivar surpassed the Waltham 29 in this respect (Table7). This cultivar gave the longest main head diameter and consequently main head weight. Also, the illustrated data reveal that Lithovit application had a significant effect in this respect in the two growing seasons. The heaviest main head weights (401.033 and 391.417g in the first and second seasons, respectively) were obtained from plants treated with 0.05% Lithovit. The illustrated data show that the first order interaction between planting methods and cultivars was significant in this respect in both seasons. The highest values 571.117 and 579.167 g in the first and second seasons respectively were obtained from transplanting Calabrese cultivar. Also, the first order interaction between planting methods and Lithovit was significant in both seasons. The highest values (435.833 and 448.333 g in the first and second seasons, respectively) in this respect were obtained from transplanting untreated plants. Here too, the first order interaction between cultivars and Lithovit was significant in the second season only. The highest value (587.167g) was obtained from Calabrese cultivar subjected to 0.05% Lithovit.

Total head yield (Ton/feddan):

Data in Table (8) show that planting methods had a significant effect on total head yield in the second season only. The highest head yield (4.300 ton per feddan) was obtained from trans-

planting method. Similar results were reported by Sterrett *et al.*, (1991). Also, the data reveal that cultivars had a highly significant effect on this trait in both seasons. The highest yield values were (6.944 and 6.457 ton /feddan in the first and second seasons, respectively). These values gained by Calabrese cultivar. This cultivar gave the highest main head weight. Here too, the Lithovit application had a significant effect in total broccoli yield in the two growing season. The highest mean values of total yield (5.219 and 4.620 ton /feddan in the first and second seasons, respectively) were obtained from treated broccoli plants with 0.05% Lithovit as foliar application. This is logic since the same treatment gave the highest main head weight. Berdnikov, 2010 stated positive effect of the new preparation Lithovit to the yield output of the main field cultures. Efficiency basis is attributed to increase of the chlorophyll content in the leaves. Here too, the first order interaction between planting methods and cultivars was significant in the second season only. The highest value 6.985 ton per feddan was obtained from transplanting Calabrese cultivar. Also, the first order interaction between planting methods and Lithovit was significant in both seasons. The highest values (5.507 and 5.160 ton per feddan in the first and second seasons, respectively) were obtained from direct seed sowing plants treated with 0.05% Lithovit in the first season and from transplanting untreated plants in the second season. Here too, the first order interaction between cultivars and Lithovit treatments was significant in the second season only. The highest value, 7.088 ton per feddan, was obtained from Calabrese cultivar treated with 0.05% Lithovit.

In conclusion, foliar Lithovit fertilizer can result in an increase in the productivity of broccoli. The results indicate that the highest broccoli yield under the same conditions to plant Calabrese cultivar by direct seeds and subjected to 0.05% Lithovit as foliar application or transplanting of the same cultivar without fertilization. Also, to increase the early yields of those cultivars we recommended application of 0.20% Lithovit and using transplanting as a planting technique.

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References:

Abou El- Magd M.M., A.M, El-Bassiony and Z.F. Fawzy, 2006. Effect of organic manure with or without chemical fertilizers on growth, yield and quality of some varieties of broccoli plants. Journal of Applied Sciences Research, 2(10): 791-798.

Abou El-Magd, M.M., A. Hoda, Z.F. Mohamed and Fawazy, 2005. Relationship growth, yield of broccoli with increasing N, P or K ratio in a mixture of NPK fertilizers (Brassica oleracea var. italica plenck).Annals of Agric. Sc., Moshtohor, 43(2): 791-805.

Abou El-Magd, M.M., Omaima M. Sawan; Zaki, M.F. Faten S. Abd Elall ,2010. Productivity and quality of two broccoli cultivars as affected by different levels of nitrogen fertilizers. Australian Journal of Basic and Applied Sciences, 4(12): 6125-6133.

Aboul-Nasr, M.H. and W.S.M. Ragab, 2000.Yield, head quality and nutritional composition of a new late flowering broccoli variety grown under Assiut conditions. Assiut Journal of Agricultural Science., 31(1): 55-77.

Beecher, C., 1994. Cancer preventive properties of varieties of Brassica oleracea: a review, Amer. J. Clin. Nutri., 59: 1166-1170.

Berdnikov, O.M.;L.V. Potapenko ;L.N. Skachok and O.V. Egorova,2010. Report on the biological efficiency expertise of the fertilizer "LITHOVIT" implementation for the registration in Ukraine. Record № 9.

Bilal,B.A., 2010. Lithovit: How it acts as fertilizer. Pro-active agriculture.

http://www.proactiveag.com/Lithovit.html.

Butt,A.M.,M.K.Imam,N.N. Kandeel and G.H.Abd El-Rehium,1988.The performance of some cauliflowers under Assuit conditions. Assiut J.Agric.Sci.,19: 267-282.

Gomez, K. A. and A. A. Gomez.,1984. Statistical procedures for agricultural research. 4th ed. John Wiley & Sons Inc. New York, USA.

Hanaa, A. abd EL-Rahman, M.F. Zaki, O.A. EL-Behairy and M.M.A. El-Magd, 2010. Effect of planting dates on productivity and heads quality of some broccoli cultivars under sandy soil conditions. Egypt. J.of Appl.Sci.,25(2A): 52-65.

Kolota E., and Osinska M., 2001. Efficiency of foliar nutrition of field vegetables grown at different nitrogen rates. In: Proc. IC Environ. Probl. N-Fert. Acta Hort., 5*63*: 87–91.

Kunicki E., 2004. Uprawa brokułów. Hortpress, Warszawa, wyd. III. [In Polish]

Lefo institute, 2006. LEFO Instiut for food and environmental research investigation .Product details of Lithovit CO_2 foliar fertilizer for outdoor use status of 15-8-2006.

Lewis W. Jett, Ronald D. Morse, and Charles R. O'Dell, 1995. Plant density effects on Single-head broccoli production. HortScience 30(1):50–52.

Liu, L. and B.J. Shelp, 1993. Broccoli yield and nitrogen composition in response to different managment regimes. Communications in Soil Science and Plant Analysis, 24: (1-2) 61-84.

MeCall,D., L.Sorensen and B.D.Jensen,1996. Broccoli varieties spp. Rapport - Statens-Planteavlsfors, (8):32.

Michigan State University,1983. MSTAT-C Micro-Computer Statistical Program, Version2. Michigan State University, East Lansing.

Mostafa, A.F., 2006. Studies on growth and development of broccoli. Ph. D. Thesis, Fac. Agric. Cairo Univ.

Parvez. K., M.Y. Memon,M. Imtiaz and M. Aslam,2009. Response of wheat to foliar and soil application of urea at different growth tages. Pak. J. Bot., 41(3): 1197-1204.

Raun, W. R. and G.V. Johnson. 1999. Improving nitrogen use efficiency for cereal production.Agron. J., 91: 357-363.

Real Rosas, M.A, A; Lucera. Arce; M. Toyota; R,Lopez. Aguilar and B. Murillo. Amador. 2002. Precocious varieties of broccoli for agricultural dirersification in arid zones. Interciencia 27(5) : 247-251.(c.a.CABAbst.2003)

Rekowska, E., 1999. The influence of varieties and planting density on the yield quantity and quality of Italian broccoli. Folia- Universitatis- Agriculturae-Stetinensis- Agricultura, (78): 269-275. (c.a CAB Abst. 2003).

Sanchez, C.A., R.L., Roth. B.R., Gardner and H. Ayer,1996. Economic responses of broccoli and cauliflower to water and nitrogen in the desert .HortScience, 31: 2, 201-205.

Sterrett, S.B.,C.W. Coale, Jr., and C.P. Savage, Jr.,1991.Comparison of management techniques for broccoli production using a systems approach. HortScience 26(5):599-602.

Wojcik P, 2004. Uptake of mineral nutrients from foliar fertilization. J. Fruit Orn. Plant Res. Spec. ed.,12: 201–218.

Zeovita GmbH, 2007 .Internal report of Zeovita: Lithovit results .

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إستجابة صنفين من البروكلى للرش الورقى بسماد الليثوفيت تحت طرقتى زراعة

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الملخص العربى

تم إجراء تجربة حقلية بمزرعة كلية الزراعة- جامعة الازهر- فرع اسيوط خلال موسمى 2010-2011 و 2011-2012 لدراسة تأثير الرش الورقى باستخدام سماد الليثوفيت بتركيزات مختلفة على صنفى البروكلى . تم استخدام تصميم القطاعات كاملة العشوائية بترتيب القطع المنشقة مرتين بثلاث مكررات . حيث تم وضع طرق الزراعة (بالبذرة أو بالشتلة) فى القطع الرئيسية بينما تم توزيع الاصناف (كالابريس ، والثام 29) فى القطع المنشقة وتم توزيع تركيزات محدودة من سماد الليثوفيت [0% (كنترول) ، 0.05% ، 0.10% ، 0.20%] فى القطع تحت المنشقة.

أظهرت النتائج أن:

أثرت طرق الزراعة معنويا" فى كل الصفات محل الدراسة عدا عدد الفروع / نبات فى كلا الموسيمين وصفات عدد الحوامل النورية ووزن الرأس والمحصول الكلى فى الموسم الأول فقط و إستجابت معظم الصفات لطريقة الشتل ايضا .إختلفت أصناف البروكللى معنويا" فيما بينها فى كل الصفات محل الدراسة عدا صفة إرتفاع النبات فى الموسم الأول و صفة عدد الأيام من الزراعة لتكوين الرأس فى كلا الموسمين.و تفوق الصنف كالابريس على الصنف والثام 29 فى الصفات المدروسة عدا صفة عدد الفروع للنبات .

أثر الرش بإستخدام الليثوفيت الورقى تأثيرا" معنويا" على صفات إرتفاع النبات وطول الرأس وقطر الرأس ووزن الرأس و المحصول لصالح الرش بتركيز 0.05% لكلا موسمى الزراعة .

تم الحصول على أعلى محصول من الصنف كالابريس المنزرعة بالبذرة والمعامل بتركيز 0.05% ليثوفيت أو المنزرعة بالشتل بدون رش .