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The effects of different organic fertilizers on the growth of lilies (Lillium longiflorum)

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ABSTRACT: The effects of sugarcane bagasses sewage sludge-based compost (BSC), vermicompost, and fish wastes as different organic fertilizers on the growth and development of Lilies, Lillium longiflorum var Ceb-Dazzle, were evaluated. The pot experiment was carried out in a completely randomized design (CRD). Two levels (0, 10%v/v) of vermicompost, sugarcane bagasses sewage sludge-based compost (BSC) or fish waste were applied. Plants were grouped in four different treatment groups including control (C), sugarcane bagasses sewage sludge-based compost (B), vermicompost (V) and fish waste (F). Our results indicated that the application of vermicompost and bagasses compost as fertilizers, especially the first one, had promoting effects on the growth and development of lilies, whereas, the applied fish fertilizer was not only effective treatment but also harmful one. While vermicompost and bagasses compost, especially the first one, had positive effects on root length, root fresh weight, plant height, stem fresh and dry mass, the applied fish waste as fertilizer adversely influenced these mentioned parameters related to the plant growth. The total chlorophyll amounts in the all treated samples were higher than control groups. It seems that the higher chlorophyll found in F groups despite of the observed inhibiting effects of the applied fish fertilizer on the plant growth could resulted from the lower leaf fresh mass.

keywords**:** Industrial wastes, vermicompost, sugarcane, compost, environment, ornamental

INTRODUCTION

The negative effects of agricultural activities may be reduced by the organic fertilizers (Ladan Moghadam et al., 2012**).** Sugarcane is universally used as a feedstock for ethanol and sugar production (Rezende et al., 2011). After sugarcane is milled for extraction, bagasse is obtained as a waste (Betancur et al., 2010). It is discarded as an agricultural waste or burned (Pauly and Keegstra, 2008; Betancur et al., 2010; Rezende et al., 2011). The application of bagasses sewage sludge-based compost in agricultural activities may minimize its environmental impacts.

The fishing trade produces large amounts of waste which may have potential for agricultural activities (López-Mosquera et al., 2011). According to the importance of environmental issues, more attention has been paid to the replacing of chemical fertilizers with biological ones (Hu and Barker, 1998). The application of the biological fertilizers such as vermicomposts produced through interactions between special earthworms and microorganisms from the breakdown of organic wastes (Edwards et al., 2010) increases the quality and sustainability, in addition to saving of the environment (Kader et al., 2002).

Lilium is a member of Liliaceae family. Lilies have special economic importance because of their attractive flowers. The main object of this study is the assessment of the effects of sugarcane bagasses sewage sludge-based compost, vermicompost and fish waste as different organic fertilizer on Lillium longiflorum var Ceb-Dazzle, an important ornamental plant.

MATERIAL AND METHODS

The bulb of Lillium longiflorum var Ceb-Dazzle had been purchased through a reliable center. The pot experiment was carried out in a completely randomized design (CRD) with four treatment groups. Two levels (0, 10%) of bovine manure vermicompost, sugarcane bagasses sewage sludge-based compost (BSC) or fish waste

were used. Plants were grouped in four different treatment groups including control (C), sugarcane bagasses sewage sludge-based compost (B), vermicompost (V) and fish waste (F).
Plants were grown in natural light and harvested after completing the period of growth and flowering.
Parameters related to the plant growth like stem height, stem fresh and dry mass, root length, root fresh weight were determined.
Chlorophyll contents were measured according to the method previously described by Arnon, 1949 using aceton 80% (v/v) as an extraction solvent and expressed in $\mu g g^{-1} fw$.

The data were analyzed as a factorial experiment by analysis of variance using SPSS software. Mean comparison was done by Duncan's multiple range test at $P<0.05$ level.

RESULTS AND DISCUSSION

Our results indicated that the application of vermicompost and bagasses compost as fertilizers, especially the first one, had promoting effects on the growth and development of lilies or at least did not reduce; whereas the applied fish fertilizer was not only effective treatment but also harmful one where the plants grown in F treatment groups did not even flower. As it was shown in figures 1 and 2, root system was affected by the applied treatments. While vermicompost and bagasses compost had positive effects on root system, the fish fertilizer adversely influenced root length and fresh weight (figures 1, 2). The application of vermicompost and bagasse compost resulted in higher plant height where vermicompost treatment was more effective than bagasse one (figure 3). However, the plant height was adversely affected by the applied fish fertilizer (figure 3). Unlike the inhibiting effects of fish fertilizer, the elevated stem fresh and dry weight in comparison to the control samples resulted from the applied vermicompost (figures 4, 5). As it was shown in figure 6, the chlorophyll amounts in the all treated samples were higher than control groups. It seems that the higher chlorophyll found in F groups despite of the observed inhibiting effects of the applied fish fertilizer on the plant growth could resulted from the lower leaf fresh mass in the mentioned treatment groups (F). The vermicompost-enhanced growth observed in present research, despite of the low used amount, could be attributed to the humic compounds and nutrients present in vermicompost which may promote plant nutrition. In the present study, the application of BSC did not induce any reduction in plant growth compared to the control which is in agreement with Jayasinghe (2011). The improved growth and biomass were recorded in various vermicompost treated plants (Gutiérrez-Miceli et al., 2007; Bachman and Metzger, 2008; Warman and AngLopez, 2010; Ladan Moghadam et al., 2012). It is recorded that in comparison to the composts, vermicompost was richer in humic compounds (Dominguez et al., 1997). The application of humic acids derived from vermicompost resulted in increased growth of tomato and cucumber (Atiyeh et al., 2002). It is stated that vermicompost could affect biochemical processes in plants because of hormone like compounds (Sahni et al., 2008). The promoting effects of vermicompost as a soil supplement are related to the nutrients and biologically active plant growth influencing substances (Atiyeh et al., 1999; Arancon et al., 2004; Warman and AngLopez, 2010). Bagasses compost addition to the soil did not induce any reduction in plant growth compared to the control (Jayasinghe, 2011). Recycling Bagasses compost as fertilizer will generate economical profits (Jayasinghe, 2011). The inhibited growth of lilies as a result of applying the used fish wastes as a fertilizer could be attributed to the high EC and phytotoxity of it.

In conclusion, according to our results it seems that vermicompost could promote plant growth and bagasses compost at least does not have reducing effects where as the application of fish waste adversely may affect plant growth. Therefore, the application of fish wastes as a fertilizer is not recommended.

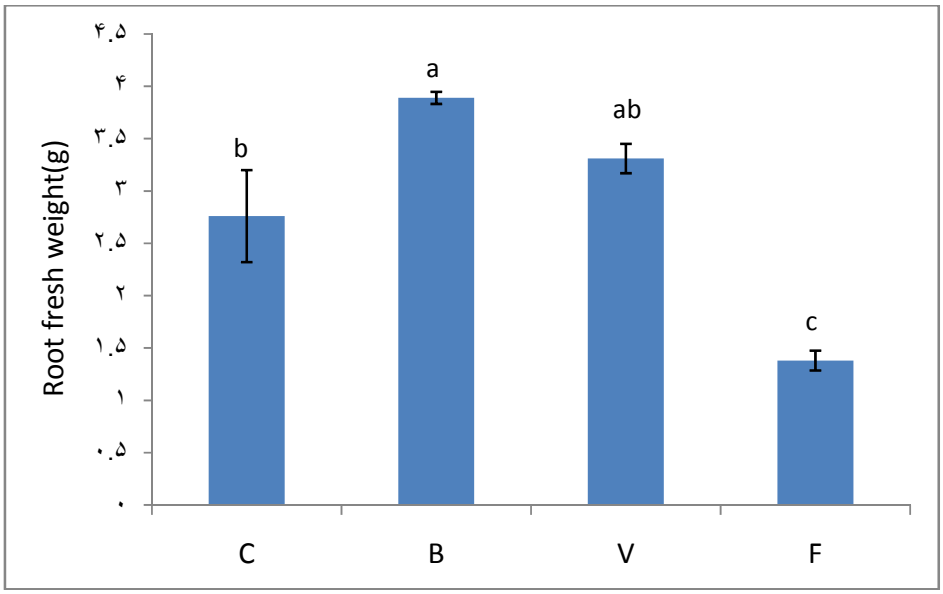

Figure 1. the effects of different applied fertilizers (vermicompost, bagasses compost and fish fertilizer) on the root fresh weight. The vertical bars indicate standard errors.

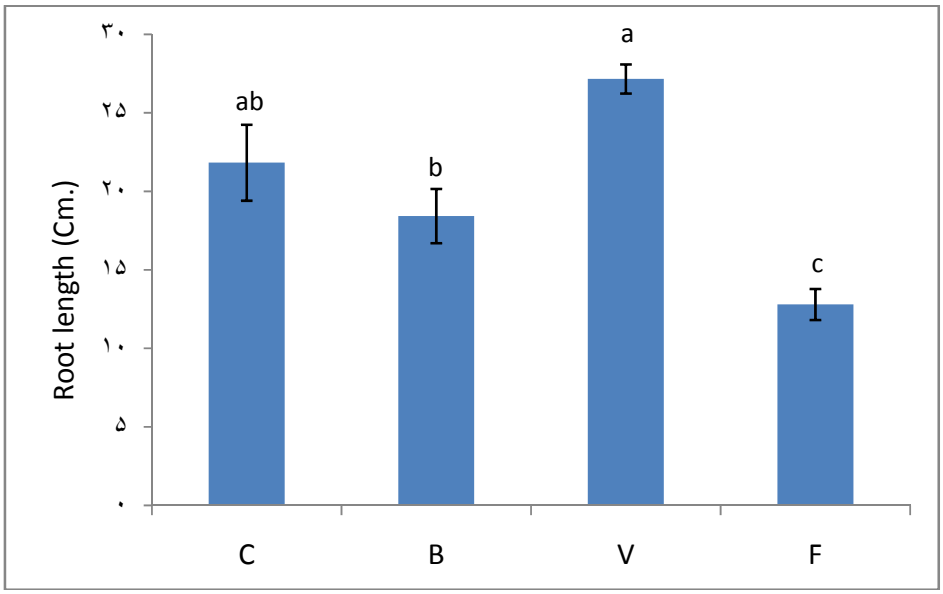

Figure 2. the induced changes in root length by the application of different fertilizers (vermicompost, bagasses compost and fish fertilizer). The vertical bars indicate standard errors.

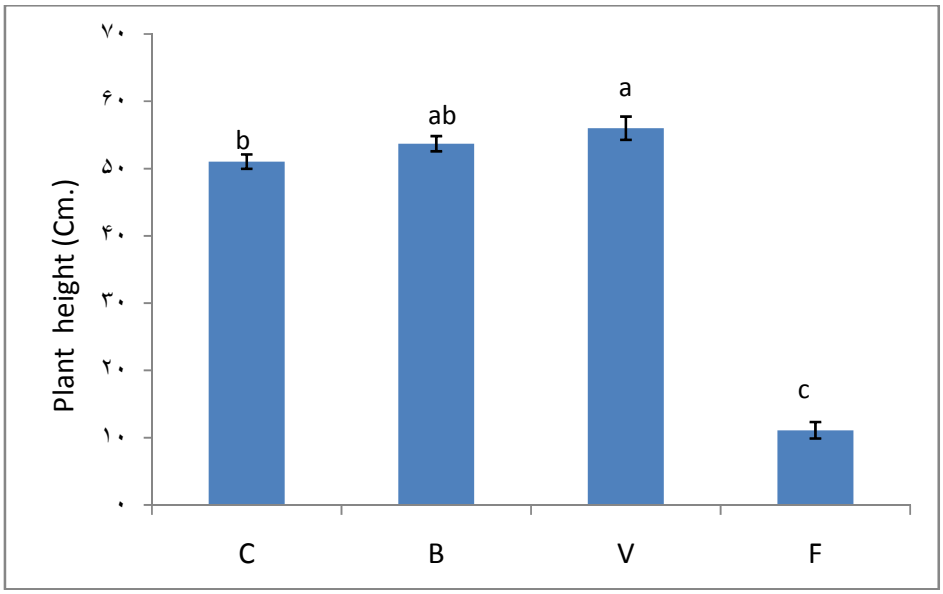

Figure 3. the induced changes in plant height by the applied fertilizers (vermicompost, bagasses compost and fish fertilizer). The vertical bars indicate standard errors.

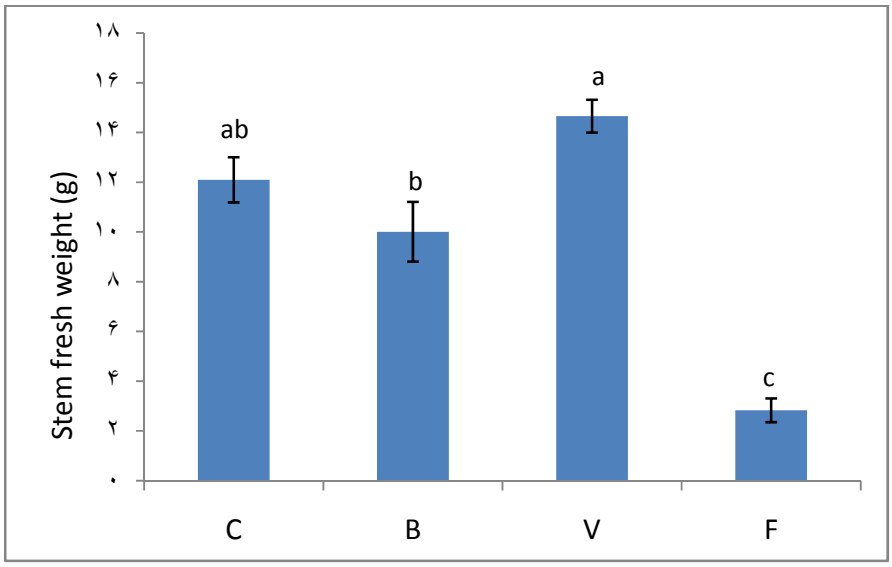

Figure 4. the effects of the used fertilizers (vermicompost, bagasses compost and fish fertilizer) on the stem fresh weight. The vertical bars indicate standard errors.

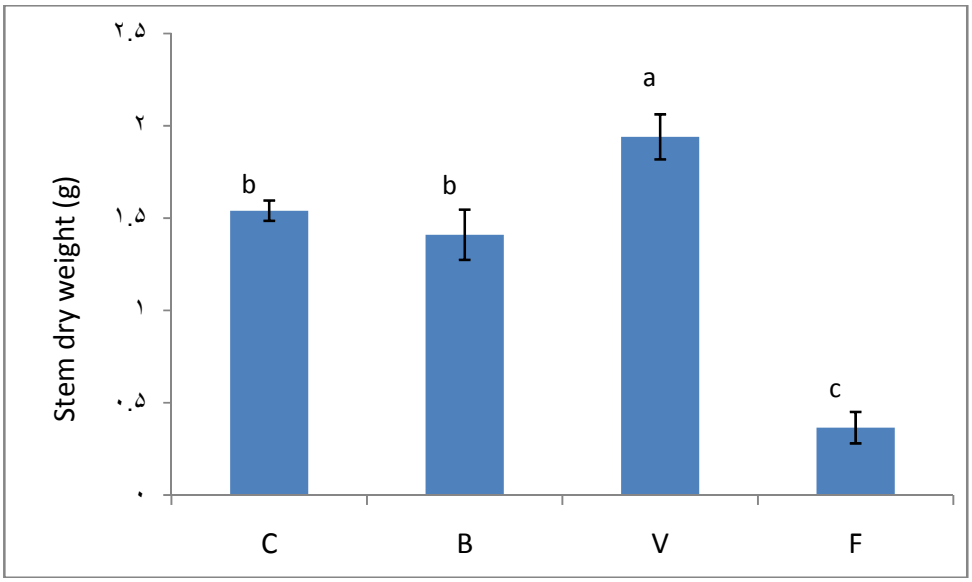

Figure 5. the effects of the used fertilizers (vermicompost, bagasses compost and fish fertilizer) on the stem dry weight. The vertical bars indicate standard errors.

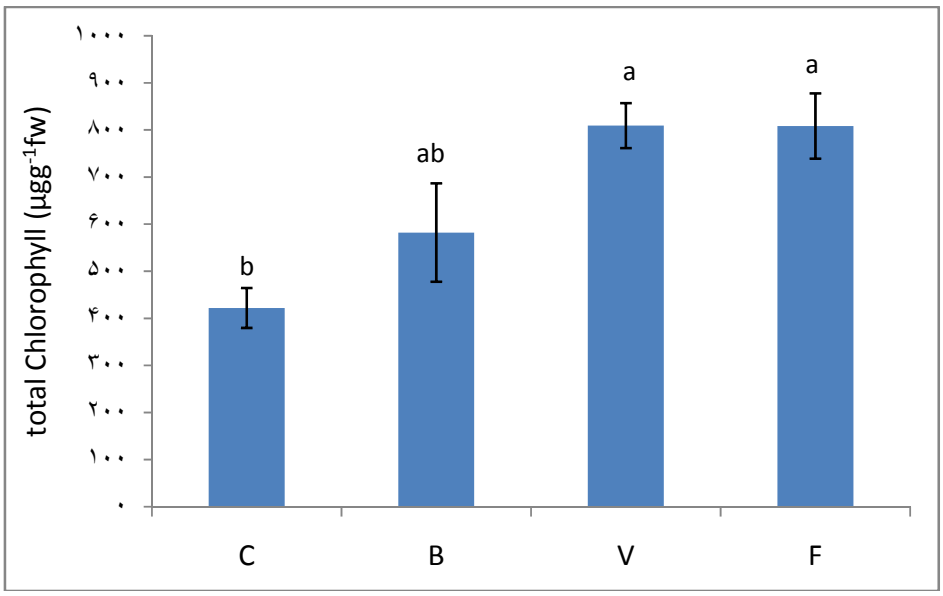

Figure 6- the effects of the used fertilizers (vermicompost, bagasses compost and fish fertilizer) on the chlorophyll content. The vertical bars indicate standard errors.

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