CO_2 efflux from agricultural soils in hungary

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Introduction

Agricultural lands may act as either a source or a sink for atmospheric greenhouse gases, three main greenhouse gases: carbon dioxide (CO_2), methane (CH_4), and nitrose oxide (N_2O) (Vergé et al., 2007). Agricultural practices that affect soil C include tillage system, cropping system, N fertilization (NH_4NO_3), and other practices. The mechanism of soil CO_2 emission to the atmosphere, however, involves the movement of CO_2 through soil pores, and release from the soil system can be measured at the soil surface .Factors such as soil temperature, soil moisture, cropping system, and N availability can all influence soil microbes and their activity where the soil respiration involves organisms metabolizing substrates producing CO_2 within the soil matrix (Anderson, 1982).

Carbon dioxide loss from soil can be associated with microbial decomposition of organic matter and root respiration (Witkamp and Frank, 1969; Hanson et al., 2000). our main goal is to identify the different effect of the amount of the mineral fertilzer (NH_4NO_3) ,and the soil moisture on soil CO_2 emission, and to identify the enzyme activity of microbial populations in our soil.

Materials and methods

From Kartal site which is an Eddy Covariance station we conducted soil samples to lab and we put it into PVC tubes, the tubes were filled with the soil and we used the remaining space as chambers for the emission of CO_2 measurements .Our manipulation experement was divided into two periods , the first contained a series of 27 pots and the second contained 30 pots : bare soil (9 pots) and the other pots were planted with weat plants . NH_4NO_3 fertilizer was applied on the surface of the soil at the begining of the study period with different level of treatements. These measurements were kept under favorable conditions which are (soil water content 20-25%, air temperature 20°C , 12 hours of light.) for the CO_2 measurement we connected the chambers to a Picarro G1101-i gas analyser for 20 minutes in lab measurement each week during 5 weeks long study period . and with LI-6400 and EGM-4 for field measurement . and for the microbiology experement we used the FDA which is a simple method for measuring the total microbial activity.

Results and discussion

The graphs showed that ; 1-The soil CO_2 efflux was significantly higher at the higher soil moisture level (25%), but it was not affected by the increasing of fertilizer amount (0kg/hec, 50kg/hec, 100kg/hec, 150kg/hec). The higher soil moisture affect the CO_2 efflux by increasing both the decomposition the soil organic matter and the respiration of the root and the rhizosphere.

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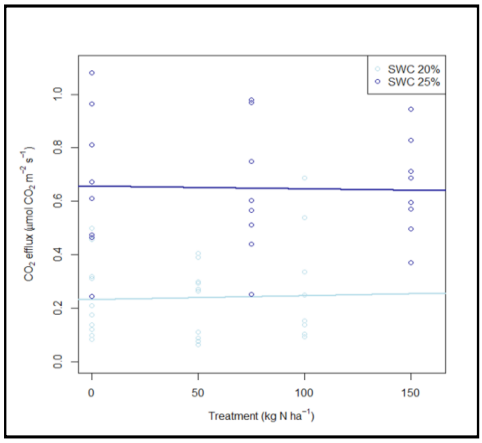

Figure 1: CO_2 efflux of the different treatments and at two different soil moisture levels 20 and 25%

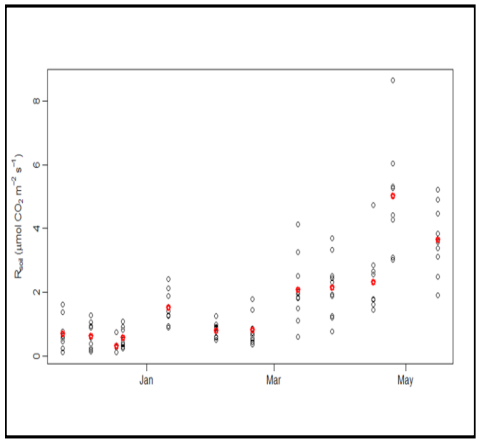

Figure 2: field measurement (November2017 –May 2018)

2-The field measurment showed that the soil respiration was lower in the winter period and its begin to increase with the temperature in the beginig of the spring period spetially in May it reach the maximun value (5 µmol CO_2 m^{-2} s^{-1}) and we still measure the soil respiration .

Conclusions

The present study showed that there is a positive effect of soil water content with different levels (20-25%) on the soil CO_2 emission which effect both the decomposition of SOM and the respiration of the root and the rhizosphere but we didn't find any effect of the mineral fertilizer NH_4NO_3 with different treatment on the soil CO_2 emission and concerned the microbial activity there are no significant result because there are no differences between the treatments in our soil.

Acknowledgement

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