

T-C Amount in soil aggregates under different pressures following substrate incorporation.

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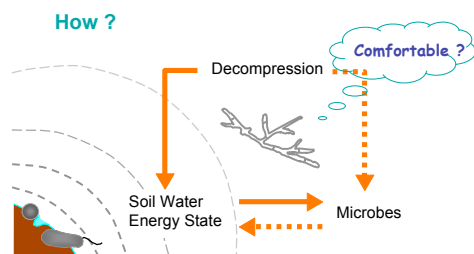
Key words: Decompression, Total carbon amount, Microbe, Soil water, Soil aggregate

ABSTRACT

With the growing concern over the sustainable use of soil organic matter, it is important to know the relationship between microbial activity and the physics of soil. This study measured changes in the T-C in soil aggregate and crushed aggregate at sub-atmospheric and atmospheric pressures, following substrate incorporation, to examine the effect of decompression on microbial activity in soil. The T-C decreased rapidly in the beginning and decreased more slowly at later time stages. The decrease in T-C varied with pressure. The decrease in T-C was greatest at a gauge pressure of approximately -20 kPa. The decrease also differed between the aggregate and crushed aggregate samples. These results suggest that the chemical potential of soil water changes with decompression, affecting the vital activity of microbes. Furthermore, soil aggregates play an important role in this activity.

1. INTRODUCTION

Water takes various energy state in soil. Soil microbes will be affected by the soil water.

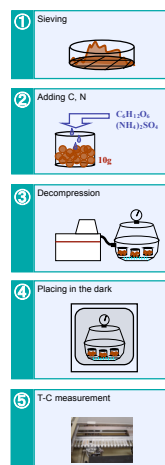


2. EXPERIMENT

Table 1 Physical and chemical properties of the sample (Farmland of kuroboku soil, Japan).

Sample	Aggregate size mm	Maximum water holding capacity 10 ² kg kg ⁻¹	T-C mg g ⁻¹	T-N mg g ⁻¹	C/N	pH (H ₂ O) (1.2.5)
A	0.85~1.70	43	20.9	1.4	14.9	6.6
B	1.70~2.36	43	19.9	1.4	14.2	6.6
C	Crushed B	88	19.9	1.4	14.2	6.6

(2) Method



(3) Conditions

- Sample A: 0.85 ~ 1.70 mm
- Sample B: 1.70 ~ 2.36 mm
- Sample C: Crushed B
- Water content: 25% (Maximum water capacity >60%)
- T-C = 30 mg C g⁻¹dry soil (C₆H₁₂O₆ = 10 mgC g⁻¹dry soil)
- T-N = 2 mg N g⁻¹dry soil (N(NH₄)₂SO₄ = 0.6 mgN g⁻¹dry soil)
- Gauge pressure: -60, -40, -30, -20, -10, 0 kPa
- Temperature = 27°C
- Relative humidity = 100%
- For 15 days
- Full automatic N. C. Analyzer (Sumika Chem. Anal. Service)

3. RESULTS & DISCUSSION

(1) Time stage

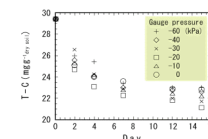
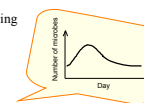


Fig.1 Changes in the T-C amount in soil aggregate. (Sample B)

T-C amount decreased rapidly in the beginning and decreased slowly at later time stages.

Caused by change in number of microbes.



(2) Pressure

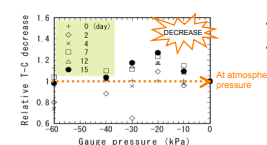


Fig.2 Decrease in T-C under the different pressure conditions. (sample B)

Great decrease of T-C amount was observed under sub-atmospheric pressure. The maximum decrease was found around pressure of -20kPa.

Maybe come from change in microbial activity number of microbes affected by change metabolism of microbes in soil water energy state accompanied with decompression.

(3) Aggregates

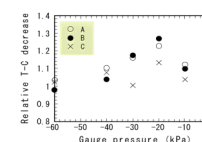


Fig.3 Decrease in T-C for 15 days. (sample A, B, C)

The decrease of T-C amount differed between the aggregate and crushed aggregate.

Soil structure would play an important role for the relationship between microbial activities and decompression.

Summary

We measured changes in the T-C amount in soil aggregate at sub-atmospheric pressures (-60~0 kPa), to examine the effect of decompression on microbial activity in soil.

Results : In sub-atmospheric pressures, the T-C amount decreased more than atmospheric pressures.

The decrease in T-C was greatest at a gauge pressure of approximately -20 kPa.

These results suggest that the chemical potential of soil water changes with decompression, affecting the vital activity of microbes.

Please tell us appropriate references you know.