A SURVEY OF MICROORGANISM AND ITS BIOLOGICAL EFFECTS IN THE STRAW COVERED FIELD

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ABSTRACT

This study compared and determined the quantities, types and biological activities of microorganisms in the soil covered and uncovered with straw.
By creating straw mulch on the soil, the number of /nitrogen fixation/ useful bacteria has increased 1.3-2.2 times more than in the uncovered field. Also the cellular depleting bacteria around 0.7 million pieces, and the number of fungal pathogen 0.17 million pieces more than in the uncovered version.
The soil biological activity has decreased 0.0037-0.0009 kg. hour/ha at the beginning of planting and at the end of harvesting. It depends on the number of bacteria.

KEY WORDS: CO_2 emission, bacteria, fungi, cellulose decomposing and nitrogen fixing bacteria

INTRODUCTION

The soil is the source of plants and animals existence and foundation of human life. One of the characteristics of soil is the fertility and its biological activity. The biological activity is usually determined by its emitting carbon dioxide and it is the main indicator of soil microorganism activity.
Biological activity is mainly depends on types of soil, vegetation, soil background reaction, the quality and quantity of organic substances and climate. It has high fluctuation.
More than 70% of carbon dioxide is emerged by metabolism of microorganisms and the rest 30% is emerged by root respiration.
Bacteria, actinomycetes, microscopic fungi are the main representatives of soil microflora.
A large number of micro-organisms have in the dark soil, and they found out more than ten million to one billion cells of microorganisms per kg of soil. This means 3-5 kg / ha biomass.
Microorganisms play an important role in soil fertility and plant nutrition. More functionality of microb complex, their sensitiveness to any changes in soil give a chance to use from microbiological characters as criterion in estimation of soil condition [5].
The structure of soil is pretty variable and it is worn down by water and wind. So it seems, these problems will be solved by creating a cover. Specially, the straw cover gives the substance that contains fertility so it increases the microorganism's activity.
In 2007, a survey conducted in Canada. It shows, between 1990 and 2005 the greenhouse gas was increased by 36% and the key factors were vehicles,

(36%), agriculture, farming (30%), energy (26%), waste (5%), industry (2%). As we can see the amount of agriculture and farming is large and it is coursed by soil cultivation, soil desertification, and burning of plant waste. Hungarian scientist that studied the numbers of total bacteria, and microscopic fungi increased from the control, through crushed pine bark, straw, to manure. The number of cellulolytic bacteria decreased in order: manure, crushed pine bark, straw and control on average for the four samplings in both years. Based on the results of soil biological examinations, covering matters are suggested to put into practice in the following order: manure, crushed pine bark and straw[2].

It is therefore necessary to explore and identify trends in the number of microorganisms are the types and relationship of its biological activity in the soil cover.

Research purposes of our study set to determine the impact of the number and types of microorganisms, and biological activity in the soil covered field

1. Effect of straw cover on soil biological activity
2. What impact a straw cover to determine the number and types of soil microorganisms

Methodology

In the experiment, the soil was fetched from wheat field of straw cover in Khongor sum of Plant Agricultural University experimental field between 2013 and 2014.

Soil sampling and microorganisms counting

Soil samples were obtained three times (May- before planting, July- during the effective growing season and September- end of harvesting) in both experimental years. Each sample was taken from the top 0-20 cm layer (4 replicates 50-100 g), of soil by disinfected tools and were kept in the special protected containers. This experiment was done for a short term.

General survey of soil microorganisms was studied in the collected soil samples using the selective media; Meat peptone agar for bacteria, chapeck media for fungi, starch amino agar for actinomycetes, Grape agar for Cellulose decomposing bacteria, Ashbi agar for Nitrogen fixation bacteria.

The number of different groups of microorganisms was determined by the inoculation method. 1 g dry soil is dissolved in the water for analysis, it is diluted some times by taking 1 ml from suspension (10^{-5} and 10^{-7}). From the same suspension 0.1 ml was planted in the standard nutritious environment and incubated in 30°C thermostat bacteria for 3 - 5 days and fungi for 7-10 days. A total quantity of the clones grown in the environment was calculated for the unity which forms clones in one gram of dry soil.

Each examination was carried out in three replications and the results were conversed into absolutely dry soil. Results were estimated by an analysis of variance.

1. **Soil biological activity research**

To determine the biological activity of the soil respiration intensity method normally, three times (for example, planting, growing and harvesting) in the period. Carbon dioxide evolved from soil in closed chamber is absorbed . A cylindrical chamber made of PVC. 10 ml of 0,2 N NaOH and titration were used 0,05 N HCL solution using phenolphthalein for observant CO_2.

$$D = \frac{(a-b) * 1.1 * 1000}{s * t * 1000 * 1000}$$

D- soil respiration, kg.hour/ha
a,b – titration of 0.05N HCI
s- SQUARE coating chamber, m^2
t- Tasting time
CO_2 equals to 1.1=1ml HCI

RESULTS

1. The result of soil microorganism

The experiments were carried out 4 times for each variation in the covered and uncovered field. 50-100 gram samplings were taken from 0-20 cm depth in each period (planting growing and harvesting) in order to define the numbers and types of microorganism (Table1).

Table1

Total amount of determined microorganisms (million/1g soil):

Version	Duration	Total bacteria	Thereof		Actinomyces	Fungi	Total microorganisms	Proportion of the types		
			N fixation	Cellulose decomposer				Bacteria	Actino-myces	Fungi
Covered	May	114.5		4.4	6.2	0.2	120.9	94.7	5.2	0.14
	July	82.9	26.3	23.7	1.6	0.6	85.1	97.4	1.9	0.72
	Sept	78.3	35.4	4.7	1.9	0.4	80.6	97.1	2.4	0.50
Uncovered	May	110.4		3.9	12.7	0.04	123.1	89.6	10.3	0.03
	July	74.9	11.6	25.8	10	0.1	85.0	88.1	11.8	0.16
	Sept	91.8	27.1	1.1	6.7	0.5	99.0	92.7	6.8	0.51

Before the planting, the number of microorganism is in the covered field 120.9 million in the uncovered field 123.1 million. There is a little difference among all bacteria, cellular depleting bacteria and the number of total microorganisms. Although there is no comparison between the two versions (coating and without coating) the number of uncover soil was 12.7 million units, or more than twice the cover of actinomycetes, as well as the cover of the fungus was great or 0.17 million units per 1 gram of soil.

In July, during the growing season, the number of microorganisms decreased in 2 variations because of the less moisture when it was sampled. But by comparing with planting period result, the number of cellular depleting bacteria increased 5.4 times in covered version, 6 times in uncovered version. It shows during planting stage, the cellulose was decomposed intensely. Also the number of nitrogen fixation bacteria in covered field 2.4 times more than in uncovered field.

After harvesting, the number of microorganisms became 80.6 million. That is less than uncovered version by 18 million pieces. But nitrogen fixation bacteria increased by 8.3 million, cellulose decomposer bacteria increased by 3.8 million.

As the result, the soil covered by straw provides rich moisture, protects from sun ray and produces the comfortable cultured to grow microorganisms. On the other hand it tends to increase the fungi pathogen. However it will be the comfortable environment to cellulose decomposer, to increase efficient microorganisms and nitrogen fixation bacteria. The proportion of fungi increases with straw mulch increase, however that didn't change fundamentally .The proportion of bacterium actinomyces is stable with straw mulch increase, however that of bacterium increases with straw mulch increase later, that of actinomyces decreases with straw mulch increase at the same time.

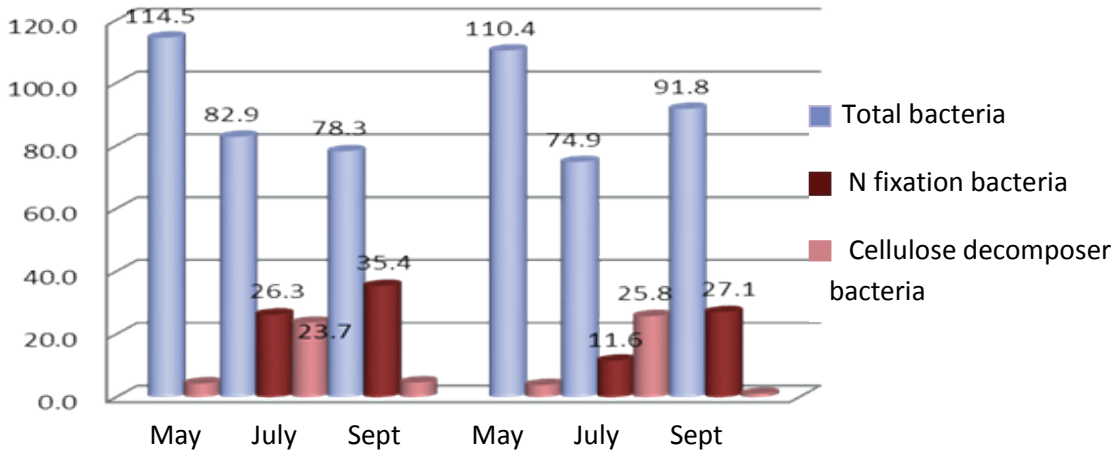
Table 2

Soil moisture, mm (0-20 cm depth)

Version	Before planting (May)	July	After harvesting (September)
Covered	31.2	21.3	23.2
Uncovered	28.8	19.4	24.7

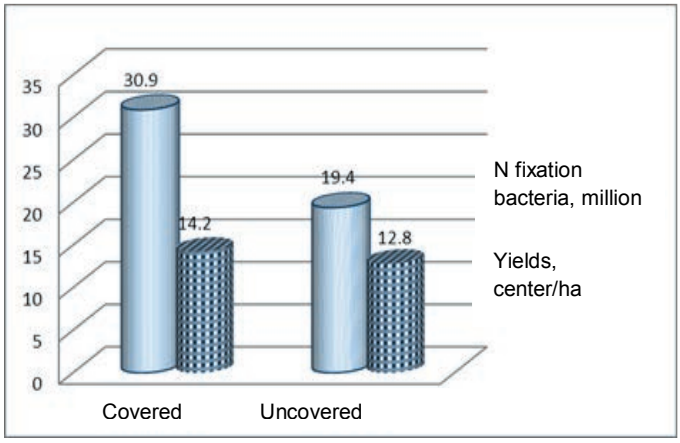
According to the amount of all types of microorganisms, the bacteria in covered field sized the most amounts (94-98%), in uncovered field actinomyces is amount of 6.8-11.8 %.

Also amount of the fungi is higher in covered version than in uncovered version. Accordingly, the number of soil microorganisms and proportion of its inner types are changing in summer depends on moisture.



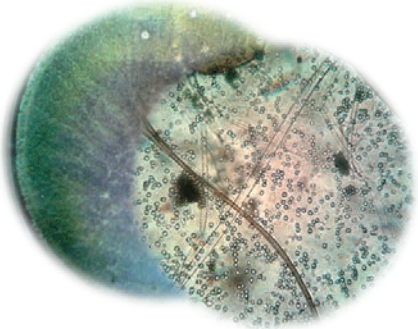
Picture 1. Soil bacteria content in the covered field

When compared the soil nitrogen fixative bacteria, it is higher in covered version than in uncovered version and it influenced the wheat growth (Pic.2).

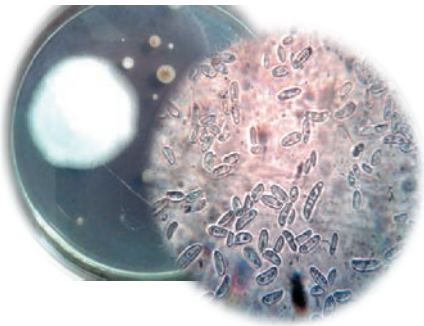


Picture 2. Soil nitrogen fixation bacteria and yields relations
Resource: From the research work titled "Creating a cover and covering effects in plant"

The number of fungus was more in covered version. *Fusarium* spp was (70% of total fungus), *Penicillium* spp type of fungi has grown. *Fusarium* spp type of fungi spoils the plant root, and *Penicillium* spp type of fungi creates green molds.



Picture 3. *Penicillium's* growth and spore



Picture4. *Fusarium's* growth and spore

2. Study of soil biological activity

Soil biological activity was studied by Shtatnov method on the covered and uncovered field soil in all periods (planting, growing and harvesting) (Table 3.

Table 3

Treatment	CO_2 emission, kg. hour/ha			
	May	July	September	Average
Covered	0.0037	0.0027	0,0009	0.0024
Uncovered	0.0073	0.0011	0.0018	0.0034

The CO2 emission rates decreased from the beginning to end of harvest both treatments.

DISCUSSION

This study was designed at identifying the nature of the changes in the populations of the major taxonomic groups of microorganisms (bacteria, anaerobic nitrogen-fixing bacteria, cellulose degradation bacteria, actinomycetes and fungi) on the background of the soil cover and do not cover with straw.

Although there is no comparison between the two versions (coating and without coating) the number of uncover soil was 12.7 million units, or more than twice the cover of actinomycetes, as well as the cover of the fungus was great or 0.17 million units per 1 gram of soil.

As a result, thatched provides increases soil moisture, protect from the sun ray and produces comfortable cultured microorganisms to grow.

Our study can be seen that the coating will increase fungal pathogen, but it will be a comfortable environment for the expansion of supply, to improve the effectiveness of micro-organisms and bacteria nitrogen fixation.

CONCLUSION

1. As a result of creating straw cover in the soil, increased micro-organisms and provide a comfortable condition. The number of nitrogen(N) fixation and efficient bacteria has increased 1.3-2.2 times more than in uncovered version. Also the cellulose decomposer bacteria is around 0.7 million pieces per 1g soil, and the number of fungus pathogen is 0.17 million pieces more than in the uncovered version.
2. The energy of soil respiration depends on the number of soil bacteria, in covered version number is (0.0024) 1.4 times less than in uncovered version (0.0034). This shows, the cover is beneficial to protect soil resource and fertility.

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