Soil water environment under Larix gmelini forest

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1 Introduction

Daxinganling mountains
The feature of geographical environment

permafrost
Wetland coexists with permafrost
Larix gmelini
the annual precipitation is 400mm ~ 550mm.

the annual evaporation is 1200 to 1400 mm.

**index of moisture is 0.28-0.41.**
### Index of moisture of arid and humid area

<table>
<thead>
<tr>
<th>Index</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;0.05</td>
<td>Extreme arid area</td>
</tr>
<tr>
<td>0.05-0.20</td>
<td>Arid Area</td>
</tr>
<tr>
<td>0.21-0.50</td>
<td>Semi-arid area</td>
</tr>
<tr>
<td>0.51-0.65</td>
<td>Dry sub-humid Area</td>
</tr>
<tr>
<td>&gt;0.65</td>
<td>Humid area</td>
</tr>
</tbody>
</table>

**Daxinganling mountains belong to semi-arid area**
Why?

Why is there *Larix gmelini* forest of large area distributing in Daxinganling mountains?

How does this kind of forest use the limited water resources?

What characteristics of soil water environment under *Larix gmelini* forest?

So we do some research on the soil water environmental under *Larix gmelini* forest.
2 Research contents

(1) the meteorological characteristics

(2) the soil physical properties

(3) the distribution of larix Root
3 Experimental Site and Methods

Daxinganling Mountains Larix Forest Ecosystem Research Station
The study site
Location of experimental plots

- Plot 1
- Plot 2
- Plot 3
- Plot 4
- Plot 5

Horizontal distance (m)

height (m)
experimental contents

- Soil water content
  the gravimetric method was used to measure water content.
  Samples were taked once everyday within three days after rainfall in every plots.
Then we taked Samples once every three days.
  soils were Sampled in three layers.
  (litter layer; humus layer illuvial layer)
Soil physical properties
  bulk density ; soil texture ; the gravimetric ratio of humus and mineral soil particles

distribution of larix Root in different soil layers.

we sampled the roots and soil respectively in three layers, and then washed clean, natural dried and then weighted.
4 Result and analysis

4.1 Climatic characteristics

The change of air temperature monthly in 2004
The change of Precipitation monthly in 2004
4.2 soil physical characteristics

Soil profile
5.2.1 the characteristics of soil genesis layer

Litter layer: It is mainly composed of dead litter of larix and other plants, and its thickness is about 2 ~ 10 cm.

Humus layer: It is mainly composed of humus. A mass of plant roots can be observed. Its thickness is about 10 ~ 30 cm.

Illuvium: gravel and clay
4.2.2 soil physical property analysis

the comparison of soil bulk density

<table>
<thead>
<tr>
<th>Sample number</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>average</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Humus layer</td>
<td>illuvium</td>
<td>Humus layer</td>
<td>illuvium</td>
<td>Humus layer</td>
<td>illuvium</td>
</tr>
<tr>
<td>Bulk density</td>
<td>0.49</td>
<td>1.17</td>
<td>0.61</td>
<td>1.22</td>
<td>0.45</td>
<td>1.16</td>
</tr>
<tr>
<td>(g/cm³)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The average bulk density of humus layer: 0.49

the average bulk density of illuvium: 1.15

the ratio of humus and mineral particles in humus layer

<table>
<thead>
<tr>
<th>Plot</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>average</th>
</tr>
</thead>
<tbody>
<tr>
<td>ratio of humus and mineral particles</td>
<td>2.34</td>
<td>2.27</td>
<td>4.07</td>
<td>1.05</td>
<td>0.88</td>
<td>2.12</td>
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</tbody>
</table>
## illuvium texture

<table>
<thead>
<tr>
<th>Sample number</th>
<th>&gt;3mm</th>
<th>3-1mm</th>
<th>1-0.05 mm</th>
<th>0.05-0.01mm</th>
<th>&lt;0.001 mm</th>
<th>Texture name</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>75.06%</td>
<td>0.15%</td>
<td>8.72%</td>
<td>1.48%</td>
<td>2.44%</td>
<td>Silty loam</td>
</tr>
<tr>
<td>2</td>
<td>36.65%</td>
<td>0.12%</td>
<td>19.81%</td>
<td>2.65%</td>
<td>6.54%</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>41.05%</td>
<td>0.13%</td>
<td>19.00%</td>
<td>1.23%</td>
<td>14.67%</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>7.24%</td>
<td>0.02%</td>
<td>33.04%</td>
<td>3.74%</td>
<td>9.24%</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>7.28%</td>
<td>0.05%</td>
<td>26.34%</td>
<td>3.91%</td>
<td>27.27%</td>
<td></td>
</tr>
</tbody>
</table>
the characteristics of soil moisture

Soil mass water content (%) vs. date

- Litter layer
- Humus layer
- illuvium
4.3 root distribution characteristics

Root distribution status

- Litter layer
- Humus layer
- illuvium
5 Conclusion

In this study, through using data of meteorology, soil, plant root, we get the following Conclusion:

① through analysis of meteorological data, 80% precipitation happened in growing season, from June to September, in the *Larix gmelini* forest, and among them, about 67% concentrated in the period from July to August, the fast growing period of the *larix gmelini*.

② through analysis of soil data, the humus content of soil humus layer (5 to 30 cm) is highest than others, the maximum ratio of humus and mineral soil particles in different plots reach four, in this layer, the value of water-holding capacity is large, and soil moisture is high and the range of it is great. The illuvium, clay layer below 30 cm, soil permeability is very low and the soil moisture changes with time gently;

③ the roots of *Larix gmelini* mainly distribute in the humus layer of soil, about 67.9% in the humus layer, and 32.1% in the illuvium.
forecast

- If climate becomes warmer and warmer, so precipitation will reduce, water consumption will increase, humus decomposition will be fast.
- Maybe *Larix gmelini* disappear in near future in China.
Thank you for your attention!