A Big Earth Data Platform for Three Poles

**Data set of plant physiological indexes and soil water, salt and nutrient in the lower reaches of Tarim River (2000-2006)**

1、Description

In the ecosystem, soil and vegetation are two interdependent factors. Plants affect soil and soil restricts vegetation. On the one hand, there are a lot of nutrients such as carbon, nitrogen and phosphorus in the soil. On the other hand, the availability of soil nutrients plays a key role in the growth and development of plants, directly affecting the composition and physiological activity of plant communities, and determining the structure, function and productivity level of ecosystems.  
Soil moisture content (or soil moisture content): In the 9 sections from Daxihaizi to taitema lake in the lower reaches of Tarim River, plant sample plots are set in the direction perpendicular to the river channel according to the arrangement of groundwater level monitoring wells. Dig one soil profile in each sample plot, collect one soil sample from 0-5 cm, 5-15 cm, 15-30 cm, 30-50 cm, 50-80 cm, 80-120 cm and 120-170cm soil layers from bottom to top in each profile layer, each soil sample is formed by multi-point sampling and mixing of corresponding soil layers, each soil layer uses aluminum boxes to collect soil samples, weighs wet weight on site, and measures soil moisture content (or soil moisture content) by drying method.  
Soil nutrient: the mixed soil sample is used for determining soil nutrient after removing plant root system, gravel and other impurities, air-drying indoors and sieving. Organic matter is heated by potassium dichromate, total nitrogen is treated by semi-micro-Kjeldahl method, total phosphorus is treated by sulfuric acid-perchloric acid-molybdenum antimony anti-colorimetric method, total potassium is treated by hydrofluoric acid-perchloric acid-flame photometer method, effective nitrogen is treated by alkaline hydrolysis diffusion method, effective phosphorus is treated by sodium bicarbonate leaching-molybdenum antimony anti-colorimetric method, effective potassium is treated by ammonium acetate leaching-flame photometer method, PH and conductivity are measured by acidimeter and conductivity meter respectively (water to soil ratio is 5: 1).  
Soil water-soluble total salt was determined by in-situ salinity meter.  
Drought stress is the most common form of plant adversity and is also the main factor affecting plant growth and development. Plant organs will undergo membrane lipid peroxidation under adverse circumstances, thus accumulating malondialdehyde (MDA), the final decomposition product of membrane lipid peroxide. MDA content is an important indicator reflecting the strength of membrane lipid peroxidation and the damage degree of plasma membrane, and is also an important parameter reflecting the damage of water stress to plants. At the same time, under adverse conditions, the increased metabolism of reactive oxygen species in plants will lead to the accumulation of reactive oxygen species or other peroxide radicals, thus damaging cell membranes. Superoxide dismutase (SOD) and peroxidase (POD) in plants can remove excess active oxygen in plants under drought and other adversities, maintain the metabolic balance of active oxygen, protect the structure of the membrane, and finally enhance the resistance of plants to adversities.  
The analysis samples take Populus euphratica, Tamarix chinensis and Phragmites communis as research objects. According to the location of groundwater monitoring wells, six sample plots are set up starting from the riverside, with an interval of 50 m between each sample plot, which are sample plots 1, 2, 3, 4, 5 and 6 in turn. Fresh leaves of plants are collected, stored at low temperature, and pretreated (dried or frozen) on the same day. PROline (Pro), cell membrane system protective enzymes superoxide dismutase (SOD) and peroxidase (POD) were tested indoors.  
Preparation of enzyme solution: weigh 0.5g of fresh material and add 4.5mL pH7.8 with ph 7.8. The materials were homogenized in a pre-frozen mortar, which was placed in an ice bath. Centrifuge at 10000 r/min for 15 min. The supernatant was used for determination of superoxide dismutase, peroxidase and malondialdehyde (MDA).  
PRO determination: put 0.03 g of material into a 20 mL large test tube, add 10mL ammonia-free distilled water, seal it, put it in a boiling water bath for 30min, cool it, filter, filtrate 5 mL+ ninhydrin 5 mL, develop color in boiling water for 60min, and extract with toluene. The extract was colorized with Shimadzu UV-265 UV spectrophotometer at 515 nm.  
SOD activity was measured by NBT photoreduction. The order of sample addition for enzyme reaction system is: pH 7.8 PBS 2.4mL+ riboflavin 0.2 mL+ methionine 0.2 mL+EDTA0.1 mL+ enzyme solution 0.1 mL+NBT0.2 mL. Then the test tube was reacted under 40001ux light for 20 min, and photochemical reduction was carried out. SOD activity was measured at 650 nm wavelength by UV-265 ultraviolet spectrophotometer.  
POD activity determination: the reaction mixture was 50 ml PBS with pH 6.0+28 μ L guaiacol+19 UL30% H2O2. 2 mL of reaction mixture +1 mL of enzyme solution, immediately start timing, reading every 1 min, reading at 470 nm.  
Determination of chlorophyll: ethanol acetone mixed solution method. After cutting the leaves, the mixed solution of 0.2 g and acetone: absolute ethanol = 1: 1 was weighed as the extraction solution. After extracting in the dark for 24 h, the leaves turned white and chlorophyll was dissolved in the extraction solution. The OD value of chlorophyll was measured by spectrophotometer at 652nm.  
Determination method of soluble sugar: phenol sulfate method is adopted. (1) The standard curve is made by taking 11 20 ml graduated test tubes, numbering them from 0 to 10 points, and adding solution and water according to Table 1 respectively. Then add 1 ml of 9% phenol solution to the test tube in sequence, shake it evenly, then add 5 ml of concentrated sulfuric acid from the front of the tube for 5 ~ 20 s, the total volume of the colorimetric solution is 8 ml, and leave it at constant temperature for 30 minutes for color development. Then, with blank as control, colorimetric determination was carried out at 485 nm wavelength. With sugar as abscissa and optical density as ordinate, a standard curve was drawn and the equation of the standard curve was obtained. (2) Extraction of soluble sugar: fresh plant leaves are taken, surface dirt is wiped clean, cut and mixed evenly, 0.1-0.3 g are weighed, 3 portions are respectively put into 3 calibration test tubes, 5-10 ml distilled water is added, plastic film is sealed, extraction is carried out in boiling water for 3O minutes, the extraction solution is filtered into a 25 ml volumetric flask, repeated flushing is carried out, and the volume is fixed to the calibration. (3) Absorb 0.5 g of sample solution into the test tube, add 1.5 ml of distilled water, and work out the content of soluble sugar in the same way as the standard curve.  
The amount of solution and water in each test tube  
Pipe number 0 1-2 3-4 5-6 7-8 9-10  
1.100μg/L sugar solution 0.20 0.40 0.60 1.0  
2. water/ml 2.0 1.8 1.6 1.4 1.2 1.0  
3. Soluble sugar content/μ g 0 20 40 60 80 100  
  
Determination of malondialdehyde: thiobarbituric acid method. Fresh leaves were cut to pieces, 0．5 g was weighed, 5% TCA5 ml was added, and the homogenate obtained after grinding was centrifuged at 3 000 r／rain for 10 rain. Take 2 ml supernatant, add 0.67% TBA 2 ml, mix, boil in 100 water bath for 30 rain, cool and centrifuge again. Using 0.67% TBA solution as blank, the OD values at 450, 532 and 600 nm were determined.  
Methods for analysis and testing of plant hormones (GA3, ABA, CK, IAA): 0.1 0.005 g plant samples were taken and ground in liquid nitrogen. 500μl methanol was extracted overnight at 4℃. Centrifuge the sample and freeze-dry the supernatant. 30μl10％% CH3CN dissolved the sample. 10μl of sample solution was analyzed by HPLC. The external standard method was used to quantify plant hormones. Standard plant hormones were purchased from sigma Company. See (Ruan Xiao, Wang Qiang, et al., 2000, Journal of Plant Physiology.26 (5), 402-406) for analysis methods.

2、Keywords

Theme：Soil,Soil salinity,Soil water content,Vegetation,Organic matter,Physiological indexes  
Discipline：Terrestrial Surface  
Places：Tarim River Basin, Xinjiang  
Time：2002, 2001, 2006, 2000, 2005,

3、Data details

1.Scale：None

2.Projection：None

3.Filesize：2.4MB

4.Data format：doc

4、Space scope

|  |  |  |
| --- | --- | --- |
| - | north：42.0 | - |
| west：89.0 | - | east：91.0 |
| - | south：38.5 | - |

5、Time frame:2000-01-15 00:00:00+00:00--2007-01-14 11:59:59+00:00

6、Reference method

References to data:

HAO Xingming, CHEN Yaning. Data set of plant physiological indexes and soil water, salt and nutrient in the lower reaches of Tarim River (2000-2006). A Big Earth Data Platform for Three Poles, doi:10.3972/westdc.011.2013.db2013

References to articles:

7、Supporting project information

The influence of permafrost environment on qinghai-tibet railway construction and its environmental effect

8、Data resource provider

name: CHEN Yaning  
unit: 中国科学院新疆生态与地理研究所  
email: chenyn@ms.xjb.ac.cn  
  
name: HAO Xingming  
unit: 中国科学院新疆生态与地理研究所  
email: haoxm@ms.xjb.ac.cn