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Analysis of Soil Nutrient in University of Jinan

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Abstract. The content of nitrogen, phosphorus, potassium and organic matter in soil is an important index to determine soil nutrients. Taking the chemometrics characteristics of the soil on University of Jinan campus as the research object, eight sample points were selected from the campus of University of Jinan to determine the content of organic matter and available nutrients. The results showed that the content of available phosphorus in soil nutrients in University of Jinan campus is high, but the content of organic matter, ammonium nitrogen and potassium are all in the lower level.

Introduction

Soil is one of the cornerstones of people's survival activities and plays an important role in the development of human society. The central importance of soil to the functioning of terrestrial systems is increasingly recognized. Nitrogen, phosphorus and potassium in soil are important to plant growth. The content of nitrogen, phosphorus and potassium determines the nutrient status of soil. With the continuous development of the social economy and the continuous increase of the population, the soil environment has gradually deteriorated, and the loss of various nutrients in the soil has become more and more serious. Therefore, the investigation and analysis of soil nutrients has been done well, and the status of soil nutrients has been accurately mastered. It has certain research significance to the construction and protection of ecological environment[1-6].

Materials and Methods

Research Area. University of Jinan (west campus) is located in the southwest of Jinan City, North of Qinglong Mountain, South to Mawuzhai Mountain, West to Nanxinzhuang West Road, and east to Langmao. The climate is temperate monsoon climate with cold winter and summer heat and rain and heat in the same period. Qinglongshan and Mawuzhaishan are mountains composed of Ordovician limestone. The terrain is high in the East and low in the West. There are two rivers passing through the campus from East to West. The soil is brown soil[7,8].

Research Methods. According to the distribution of mountains and rivers in the campus, eight sampling sites were selected according to the principle of randomness. The specific location is shown in table 1, where soil of 0-20 cm surface is collected at the sampling point.

Data Determination. The collected soil samples are naturally dried, ground and sifted indoors. Soil samples less than 0.25 mm were used to determine soil organic matter, ammonium nitrogen, available potassium and available phosphorus content by soil total nitrogen total phosphorus total potassium analyzer (DP-TPY-6A). The results are shown in Table 2.

It can be seen from table 2 that the average content of organic matter is 6.9525 ‰, with a maximum of 21.17 ‰ appearing at the foot of Mawuzhai and a minimum of 2.89 ‰ at the lower reaches of the river. The average content of ammonium nitrogen is 0.8732 mg/kg, the highest 1.61 appears at the

foot of the Mawuzhai, and the lowest 0.43 appears in the middle reaches of the river. The average content of fast phosphorus is 62.805 mg/kg, with a maximum of 105.3 appearing in the middle reaches of the river, and a minimum of 25.61 appearing in the lower reaches of the river. The average content of available potassium is 44.8588 mg/kg, with a maximum of 56.7 appearing on the banks of the Mawuzhai and a minimum of 28.2 appearing in the middle reaches of the river.

Table 1. Location of sampling point.

Sample point NO.	Location	Vegetation Status
1	the foot of Mawuzhai mountain	Peach Grove
2	The banks of a river of Mawuzhai mountain	Poplar, summer grass
3	Under the overpass	Poplar
4	Songzhu Garden	Bare land
5	the lower reaches of the river	Poplar
6	the middle reaches of the river	Willow, wild, bitter, etc..
7	the middle reaches of the river-Jiazi Lake	Artificial planting of green forests
8	The upper reaches of the river	locust tree

Table 2. Location of sampling point.

Sample point NO.	Organic matter	Ammonium nitrogen	Quick-impact phosphorus	Quick-impact potassium
	(‰)	(g/kg)	(mg/kg)	(mg/kg)
1	21.17	1.6056	65.55	40.14
2	6.56	0.80162	73.78	56.7
3	6.79	0.83168	70.13	40.09
4	3.63	1.155	26.25	50.08
5	2.89	0.71288	25.61	52.37
6	6.94	0.7475	104.47	49.71
7	3.87	0.4251	105.3	28.2
8	3.77	0.7064	31.35	41.88
mean value	6.9525	0.8732	62.805	44.8588
Coefficient of Variation	184.42%	123.61%	200.33%	107.11%

Variation coefficient is a parameter that can eliminate the influence of measurement scale and dimension to compare the discrete degree of several groups of data. According to the coefficient of variation of the data, the coefficient of variation of organic matter is 85.87 %, indicating that the degree of dispersion of the data is the largest, and the content of organic matter at each sampling point is the largest difference. The variation coefficient of available potassium is the smallest, which means that the data of each sampling point is not very different.

Discussion and Results

Based on Table 3 of the criteria for the Second National Survey of Soil Nutrients, the evaluation of University of Jinan soil nutrients is shown in Table 4.

Table 3. Criteria for classification of soil nutrients in the second national census.

Level	Organic matter	Ammonium nitrogen	Quick-impact phosphorus	Quick-impact potassium
	(‰)	(g/kg)	(mg/kg)	(mg/kg)
I	>40	>2	>40	>200
II	30-40	1.5-2	20-40	150-200
III	20-30	1-1.5	10-20	100-150
IV	10-20	0.75-1	5-10	50-100
V	6-10	0.5-0.75	3-5	30-50
VI	<6	<0.5	<3	<30

As can be seen from table 4, the average soil organic matter in the University of Jinan ranks among the levels of V in the National soil nutrient classification standards, with only one of the eight sampling points having a level of III which located at the foot of Mawuzhai and four of the eight sampling points having a level of VI. The mean value of ammonium nitrogen belongs to level VI, and the highest soil content at point 1 of the eight sampling points is level II; Followed by Songzhu Garden III; The soil along the river is below level VI. The average of speed phosphorus belongs to level I and is at a high level; Three of the eight sampling points were in level II. The average value of available potassium belongs to Level V, and one of the eight sampling points belongs to Level VI and two belong to Level IV. On the whole, except for the high content of available phosphorus, the soil nutrients on the campus of University of Jinan are all at the lower level of organic matter, ammonium nitrogen, and quick-impact potassium.

Table 4. Soil Nutrient Rating in University of Jinan.

Sample point NO.	Level			
	Organic matter	Ammonium nitrogen	Quick-impact phosphorus	Quick-impact potassium
1	III	II	I	V
2	V	IV	I	IV
3	V	IV	I	V
4	VI	III	II	V
5	VI	IV	II	IV
6	V	IV	I	V
7	VI	VI	I	VI
8	VI	V	II	V
mean value	V	IV	I	V

Except for the slightly lower available potassium at No. 1 sampling point under Mawuzhai, the rest of the components are at a high level, indicating that the soil sample fertility is very high. Combined with the environment at the time of sampling, it shows that the dead leaves have a great influence on the soil nutrient content.; Moreover, the sampling site is near the foot of the mountain, and there is less anthropogenic interference, so nutrient retention is better.

There is no vegetation near the No. 4 soil sample in Songzhu Garden, and construction waste is found during the soil removal process, indicating that the soil is disturbed by artificial construction activities and is not suitable for plant growth, so the content of organic matter is low.

The soil nutrient content in the middle and lower reaches of the upper reaches of the Qinglong Mountain varies greatly, and the cover is due to the better vegetation cover in the upper reaches and the middle reaches have the influence of middle water injection.

Conclusion

In this study, samples were taken from Mawuzhai to Qinglong Mountain from the upper reaches of the river to the lower reaches of the river. The organic matter, ammonium nitrogen, quick-impact phosphorus, and quick-impact potassium of the campus soil were measured. The results showed that the content of available phosphorus in soil nutrients in University of Jinan campus was high, and the content of organic matter, ammonium nitrogen and potassium were all in the lower level. Organic fertilizer should be properly applied and retained as much as possible when clearing dead leaves, in order to increase the content of organic matter in the soil and improve the physical and chemical properties of the soil. For the problem of high phosphorus content, the use of cleaner water should be used as far as possible to control the annual use of pest and pesticide to prevent excessive phosphorus.

In addition, the nutrient distribution of campus soil is not uniform, and the upper, middle, and lower reaches of rivers vary greatly; The soil nutrients of Qinglong Mountain and Mawuzhai Mountain are also different. In addition to being related to different geomorphological sites, this is mainly affected by surface vegetation and man-made activities.

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