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Characteristics Of Peat Mine In Thoi Trang Canal,Kien Giang Province, Vietnam

Truong Dang Quang
Faculty of Engineering - Technology - Environment, An Giang University,
Vietnam National University Ho Chi Minh City

ABSTRACT
The study aimed to clarify the geological characteristics of the peat mine in Thoi Trang canal, in Kien Giang province, Vietnam and determine the quality of peat for the needs of organic fertilizer production. Research results have identified geological structure of the mine area; thickness, width of peat seam on mine area of 60ha. Sampling and analysis of silicate chemistry, semi-quantitative spectra have also assessed the quality of peat, whereby the industrial mineral body with organic humus content reaches ≥ 10% and the other technical specifications such as humic acid, N, P, K all meet the requirements to produce organic fertilizer.
Key words:*peat, geological characteristics,organic fertilizer*

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Peat soil is formed by incomplete decomposition of organic matter, accumulated over thousands of years due to lack of oxygen in submerged conditions. Vietnam has a relatively small area of peat land compared to other countries in the region; Peat is found in many parts of Vietnam but occurs mainly in the Mekong Delta and is estimated at 24,000ha (Phan Truong Khanh and Tran Thi Hong Ngoc, 2019).

Peat is an important natural resource and 70% of the world's peat reserves are used in agriculture (Shiliu Cao, 2019). Peat is a special natural biomass material with loose fibers. Porosity makes peat has large surface area and strong adsorption capacity. Therefore, peat has good permeability, hydrophilic and strong performance. Peat is increasingly playing a greater role in agriculture as soil amendments, fertilizers and farming (Shiliu Cao, 2019). In Vietnam, peat is being widely used as organic fertilizer in agriculture, so many areas of peat land have been studied for exploitation.

The peat mine in the Thoi Trang Canal area, located in Kien Luong district, Kien Giang province, covers an area of 60 hectares, located in the middle of Long Xuyen Quadrangle. The area has contiguous sides to the cajuput fields or the surrounding unexploited land. The terrain surface is flat, with an average elevation of only + 0.5m to + 1m above sea level. Some areas have sunken areas to + 0.2m or more. This area is a deserted area, a lot of wild forests with natural Melaleuca growth.

I. STUDY METHODS

a. Geological map at scale of 1/5,000:

The establishment of the geological map is conducted mainly on the basis of collecting existing geological documents to form a geological map of 1/5,000 scale plus the field geological roadmap. The study area has a variable thickness of cover layer. Road surface survey with boreholes was conducted to draw the boundary of peat and clay under.

Drilling works are to determine the thickness of the mineral body and taking samples is for mineral quality assessment. The drilling works are arranged on unconsolidated sediments of the Quaternary age; the drilling holes are made in a thick network with a linear distance of 180 ÷ 200 m and a distance of between 80 ÷ 100 m depending on the classification of peat-bearing sediments. The bore depth is 3 ÷ 4m from the ground. We have done 10-track field roadmap with a volume of over 10,000m and 60 drill holes with a volume of 204m.

b. Methods of taking and analyzing samples:

- *Number of samples:*

+ Chemical peat silicate: 10 samples.
+ Semi-quantitative spectrum: 10 samples.

- *Sampling specifications:*

Samples taken from the core in bores are the basic types of peat quality. Samples must be cleaned of dirty clay outside the core, splitted in half along the sample core and takenalongside the thickness of the mineral body. Number of samplesare 20 in total.

Because the mineral characteristics are soft porous peat, each sample is taken from the 2.5m long core, when the halving weighs about 1 to 2kg, so it must be processed and reduced to the weight needed to send send it for analysis.The number of samples to be processed is 20. Processing diagram for sample analysis as shown in Figure 2.

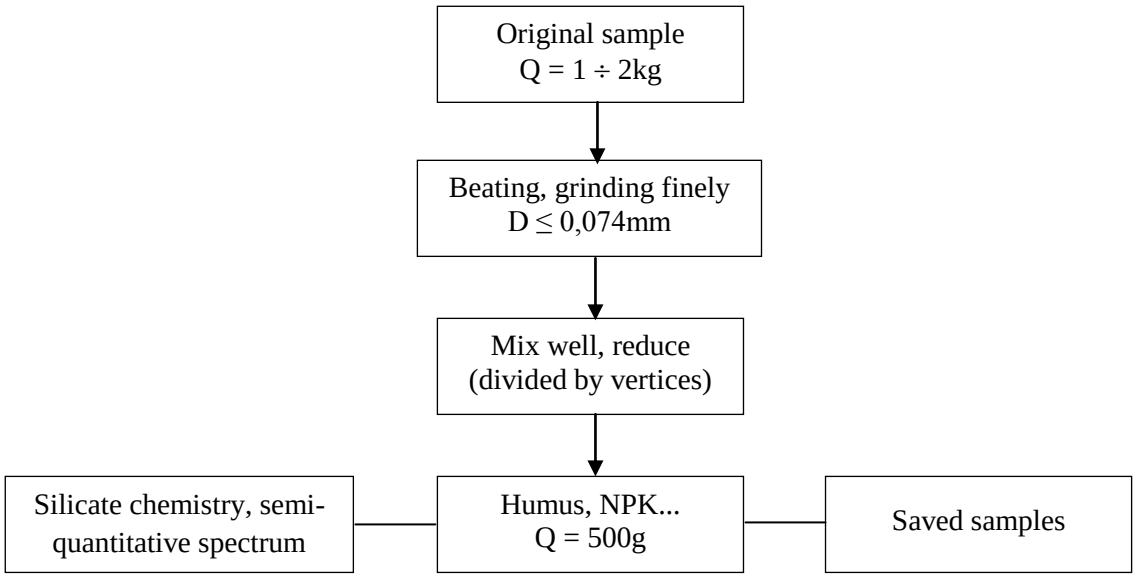

Figure 2. Processing diagram for sample analysis

- *Sample analysis*

+ Sample for determination of humus and NPK components: this is an important indicator to evaluate the quality and determine the criteria for calculating mineral reserves, based on humus, humic acid, NPK amount to outline the peat body boundary. The number of samples for analysis is 10.

+ Samples were taken in the saved portion of the core to determine the approximate content of the elements contained in peat. The results obtained from this analytical method can identify beneficial and harmful elements in peat as micro-organic fertilizer. The weight of each sample varies from 5 ÷ 10 g; The number of samples is 10 samples.

II. RESEARCH RESULTS

a. Stratigraphy

On the map, the oval-shaped peat mine extends north-south. The characteristics of the mineral body through drill holes are as follows:

The object of the mine is a horizontal layer of peat. The distribution is closely related to the formation of middle - late Holocene river marshes sediments - upper section (abQ_{IV}^{2-3}). The peat body usually has a thickness that increases gradually from the edge to the center and in some places reaches a thickness of 2.5m.

Under the peat layer is the formation of middle - upper Holocene marine sediments, the lower part ($mQ_{IV}^{2-3}{}_1$). This formation is distributed around, forming a ring shape covering the peat basin, with low plain terrain, the altitude varies from 0.5 to 1.5 m. These formations are composed of clay, fine-grained sand, the bottom contains few grit and gravel. The thickness of this formation is not stable and varies from 1 to 5 m.

The location map of the peat seam is shown in Figure 3 and some sections show the peat seam shape in the mine area (Figure 4).

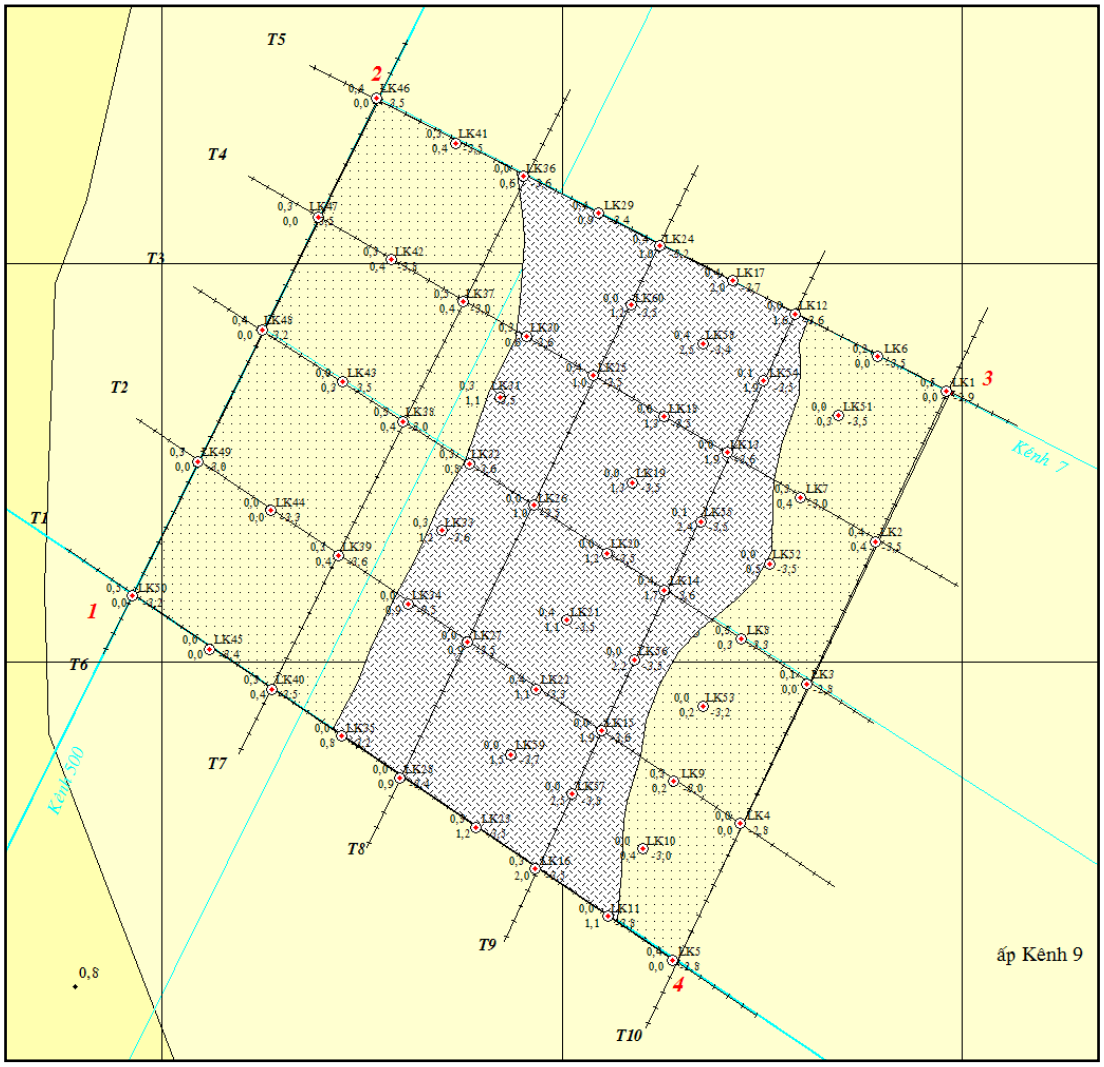

Figure 3. Diagram of peat seam location

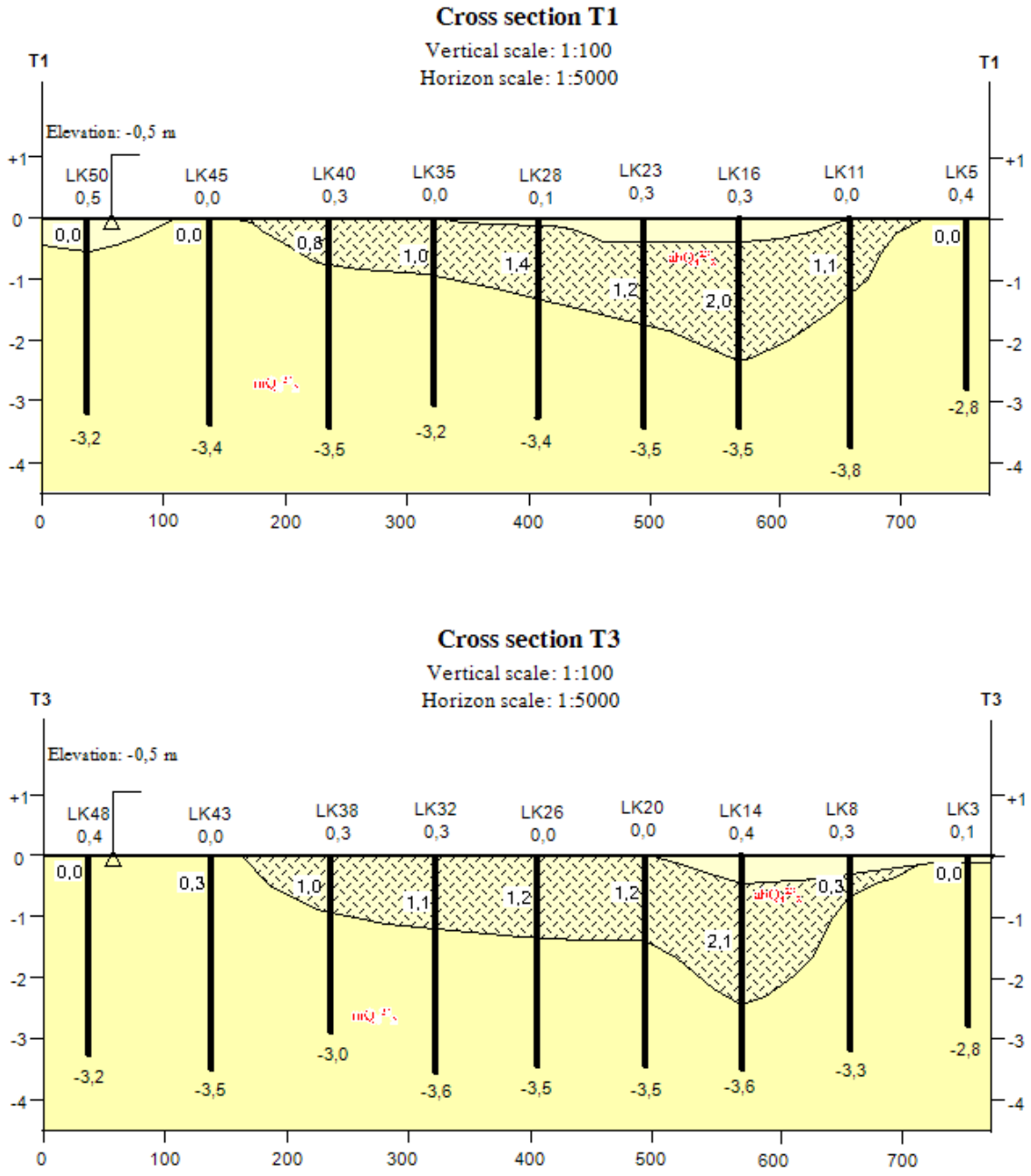

Figure 4. Cross section of some research routes across the peat seam

b. Geological characteristics

The mine area is a sedimentary strip of muddy origin accumulating in triangular style. The area has a part of terrain with height of 0.6m ÷ 1.5m, surrounded by vast delta. The entire area of peat contains water so it is easy to identify and localize when conducting geological surveys in the field, especially in the dry season.

Based on morphological characteristics, origin of peat-bearing sediments, peat formation in the study area is classified as peat strip. The whole strip of peat has a fairly homogeneous composition, formed by the process of decomposing plants into peat with thickness varying from 0.5 ÷ 2.5m.The results of the partical analysis of the peat samples showed that the material with a size greater than 0.1mm are all plant relics in the form of roots or plant humus, brown, dark brown or black.

Mineral body profile consists of two parts |:

- The top of the mineral body is the topsoil layer, covering over peat body, the thickness varies from 0.0 ÷ 0.5m. Results from the exploration boreholes show that this soil material is mainly clay, clay mud with many roots, plant material ..., the thickness varies. The maximum thickness in exploration borehole is 0.5m.

- The lower part is a layer of peat mixed with dark gray clay, whose thickness varies from 0.5m to 2.5m. Below the peat layer is transition to ash gray, dark gray clay.

c. Mineralized characteristics of peat

According to the analysis of peat chemistry of peat bands in Tri Ton - Kien Luong area, the pH varies from 2 ÷ 5; average is 3.5 (Doan Sinh Huy, 1989). Thus peat has a high acidity. The content of organic chemistry is of medium to high level compared to the peat mines being exploited as organic fertilizer in the country. Peats with high organic content, especially humic acid, are suitable for the production of plant growth stimulants (Nguyen Van Binh, Pham Huy Long, 1999).

This study gives the results of the chemical and mineralization related to peat (Figure 5) shown below.

Figure 5. Sample of peat

Chemical composition:

The analysis results of peat chemistry show that the peat has a pH of 3.08 ÷ 4.76; mean 3.82. Thus, the peat has a high acidity, and the content of the main components shows the change as follows:

- Organic carbon content changes from 28.2 ÷ 44.52%; Average: 39.54%.
- Nitrogen content changes from 0.77 ÷ 1.05%; Average: 0.94%.
- The content of P_2O_5 varies from 0.04 ÷ 0.08%; Average: 0.06%.
- The content of K_2O varies from 0.31 ÷ 0.92%; Average: 0.55%.
- Humic acid content changes from 5.09 ÷ 14.26%; Average: 10.63%.
- Electrolytes varies from 34.86 ÷ 74.06%; Average: 63.18%.
- Moisture varies from 384.27 ÷ 999.11%; Average: 697.83%.

Table 1 shows the results of peat chemistry analysis and the highest, lowest and average values of the samples.

Table 1. *Results of peat chemistry analysis*

Targets	Lowest value	Highest value	Average value
pH (H_2O)	3.08	4.76	3.82
% acid humic	5.09	1 4.52	10 , 63
% organic (% OC)	28.20	44.52	39.54
NH_4^+	6.03	18.84	9.01
N total	0.77	1.05	0.94
P_2O_5	0, 04	0.08	0.06

K_2O	0.31	0.92	0.55
Al^{3+}	v ế t	36.50	18.94
Fe^{2+}	133.44	400.78	260 , 89
% SO_4^{2-}	0.95	3.54	2.15
Electrolytes (%)	34.86	74.06	63.18
Moisture (%)	384.2 7	999.11	697.83

Note:
NH_4^+ và Fe^{2+}: mg/100g dry peat
Moisture = (amount of water lost after drying/amount of dry land after drying)

Mineralization related
Results of analysis of semiquantitative spectral samples show the percentage of elements as shown in Table 2.

Table 2*. Results of semi-quantitative spectral analysis*

Ingredient %	Min	Max	Medium
Al	0.2	2	*1.1600*
Si	0.15	1	*0.5050*
Mg	0.1	0.5	*0.3600*
Ca	0.1	0.2	*0.1100*
Ba	-	-	-
Fe	0.5	5	*1.7700*
V	-	0.003	*0.0013*
Mn	0.001	0.01	*0.0053*
Ti	0.01	0.2	*0.11170*
Co	-	0.001	*0.0003*
Ni	0.001	0.0 03	*0.0019*
Cr	-	0.002	*0.0006*
Mo	-	0,0005	*0.0002*
W	-	-	-
Sn	-	-	-
Sb	-	-	-
As	-	-	-
Bi	-	-	-
Cu	0,0005	0.005	*0.0018*
Au	-	-	-
Ag	-	-	-
Pb	-	-	-
Zn	-	0.01	*0.0035*
Cd	-	-	-
Ga	-	0.0002	*0.0001*

Ge	-	-	-
Be	-	-	-
In	-	-	-
Tl	-	-	-
Ta	-	-	-
Nb	-	-	-
Zr	-	0.005	*0.0027*
Hf	-	-	-
U	-	-	-
Th	-	-	-
P	-	-	-
Na	0.03	0.05	*0.0320*
Li	0.003	0.005	*0.0040*
Ce	-	-	-
La	-	-	-
Y	-	0.003	*0.0011*
Yb	-	0.0003	*0.0001*
Gd	-	-	-
Sc	-	0.0003	-
Pt	-	-	-

In general, the technological characteristics of peat in the mine area are as follows:

- Good decomposition and thickness varies from 0.5 ÷ 2.5 m (average 1.2 m): greater than the minimum industrial thickness (0.5 m).
- Humic acid content varies from 5.09 ÷ 14.26%; mean: 10.63%: greater than the marginal content of humic acid (≥5%).
- Organic matter content varies from 28.20 ÷ 44.52%; mean: 39,54%: greater than the minimum marginal content of organic matter (≥20%).
- Nitrogen content varies from 0.77 ÷ 1.05%; mean: 0.94%: greater than the minimum industrial indicator of nitrogen (0.25%).
- Content of P_2O_5 varies from 0.04 ÷ 0.08%; mean: 0.06%: greater than the minimum marginal content of P_2O_5 (0.01%).
- The content of K_2O varies from 0.31 ÷ 0.92%; mean: 0.55%: greater than the minimum marginal content of K_2O (0.077%).

The minimum marginal content mentioned above is an indicator used to assess the quality of peat. With the above geological characteristics, peat in the Thoi Trang Canal area completely satisfies the needs of producing micro-organic fertilizer..

III. CONCLUDE

For a long time, the market used to use chemical fertilizers, which made the soil degraded quickly and lost the humus, so consumers want to return to the traditional organic fertilizer to make the arable land fertile and porous now a day. Peat in the area of Thoi Trang Canal in Kien Luong district, Kien Giang province is of satisfactory quality to produce organic fertilizer.

The research has identified the geological structure of the mine area; thickness, width of peat seams. Sampling and silicate chemistry analysis, semi-quantitative spectra have also assessed the quality of peat on the

mine area of 60 hectares. Accordingly, the industrial mineral body with organic humus content reaches ≥ 10% and other technical specifications such as humic acid, N, P, K all meet the requirements to produce organic fertilizer.

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