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# Hydraulic conductivity and compressibility characteristics of fibrous peat

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# Hydraulic conductivity and compressibility characteristics of fibrous peat

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**Abstract**. This research was studying the mechanical characteristics of fibrous based on hydraulic conductivity/permeability and compressibility tests. The samples for the test were obtained by the block sampling method. The location of sampling was on Banyuasin Regency, South Sumatra. The permeability test using constant head method was used for hydraulic conductivity parameter of peat soil. And consolidation test using Oedometer test was also used to find out compressibility characteristics of peat soil. The hydraulic conductivity test results are horizontal hydraulic conductivity ($k_h$)=6,13x10-4 cm/s and vertical hydraulic conductivity ($k_v$) = 3.76.10-4 cm/s. The ratio of $k_h/k_v$ (20°C) about 2.04. The coefficient of kh is greater than kv, this is due to the effect of fiber arrangement such as the roots of peat soil. Beside of that, the consolidated test results based on compression index parameters ($c_c$) are 1,428 and 1,215. The consolidation coefficient parameters ($c_v$, $m^2$/year) were 13,671 (50 kPa), 11,511 (100 kPa), 8,268 (200 kPa), and 3,312 (400 kPa) from the Banyu Urip Dusun III sample. The results of parameter $c_v$ can be affected by applied the pressure where the greater the pressure the smaller the value of $c_v$.

*Keywords*: hydraulic conductivity, compressibility, fibrous peat

## 1. Introduction

The hydraulic conductivity of the soil is a function of three components: (1) ground water pressure, (2) water content, and (3) soil moisture retention. The hydraulic conductivity of the soil is needed for understanding transport processes, water balance, and irrigation [1]. The hydraulic conductivity/ permeability of peat is controlled by the original structure, engineering characteristics, high of decomposition, and density [2]. The results of hydraulic conductivity (k) of peat soil can be as sand: $10^{-5}$-$10^{-4}$ m/s.

The value of initial coefficient of vertical hydraulic conductivity from $10^{-5}$-$10^{-8}$ m/s [3]. The permeability of peat soil can be affected by mineral content, the presence of gas, degree of decomposition, chemistry, and void ratio. Previous researcher [4] reported the physical properties and


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Published data on $c_c$ ranges from 2-15. [8] reported the decrease in $c_v$ with load during consolidation due to large reduction in permeability. Beside of that, [6] determined the results from Oedometer test such as: $c_c$=3.253, $c_v$=2.074 $m^2$/year (under consolidation pressure 25 kPa), and $c_v$ =0.850 m2/year (under consolidation pressure 400 kPa).

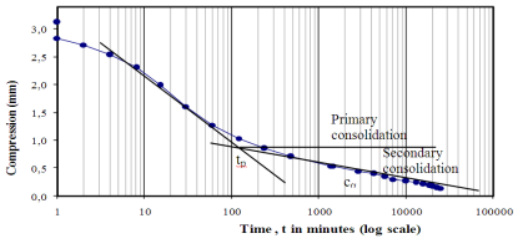



**Figure 1.** Analysis of the compression-time curves from oedometer test

There are two types of samples are undisturbed samples and disturbed samples. Undisturbed samples can be obtained at shallow depth by block sampling method (ASTM D 7015-04). In this research, undisturbed block samples had been used to determine the hydraulic conductivity/permeability and compressibility characteristics of fibrous peat.

## 2. Methodology

Mechanical characteristics evaluated in this research were hydraulic conductivity/permeability and compressibility of fibrous peat soil. The samples of the fibrous peat were taken from Banyuasin regency, South Sumatera, Indonesia. The location of hydraulic conductivity samples are hydraulic conductivity KTM Telang Mulya Sari, Dusun I Banyu Urip, Dusun III Banyu Urip, and Desa Gasing Tanjung Api-Api. And the locations of compressibility samples are Dusun I Banyu Urip and Dusun III Banyu Urip. Figure 2 shows the location of peat soil sampling.

**Figure 2.** Location of sampling

In this research, the block sampling method had been selected. The size of tube for the test Consolidation test are diameter (D) = 15 cm diameter and height (h) = 30 cm). Beside of that, the size of tube for the test hydraulic conductivity/permeability test are diameter (D) = 15 cm diameter and height (h) = 15 cm). Hydraulic conductivity measurements were carried out on a sample using constant head method. Parameter of horizontal permeability ($k_h$) and vertical permeability ($k_v$) obtained from this method. The following is the procedure of examination of hydraulic conductivity of peat soil in accordance with ASTM D 2434-68 standard.

Hydraulic conductivity testing conducted in laboratory of soil mechanic of Civil Engineering Department of the Polytechnic Sriwijaya Palembang. The sample of permeability test height (H) 93.5

cm high by permeameter test tube (L) 15 cm. The temperature will increase the viscosity decrease and increase permeability. Standard temperature in determining the permeability coefficient is 27.5°C. The parameters results from hydraulic conductivity test such as vertical coefficient of hydraulic conductivity ($k_v$) and horizontal coefficient of hydraulic conductivity ($k_h$). From the results of consolidation testing, permeability parameters will be obtained (kv).

Moreover, the parameters of compressibility of peat soil characteristics can be estimated by consolidation testing (Oedometer test). Consolidation tests at laboratory of soil mechanic of Civil Engineering Department of Universitas Sriwijaya. Procedures on consolidation testing according to ASTM D 2435-96 standard. Sample size on Oedometer test were sample height (h) = 2 cm and sample diameter (d) = 5 cm. The load increment ratio (LIR) in this test was one. As well as the pressure (P, kPa) given in the test were 50, 100, 200, and 400. At each load given for one sample will be maintained for two weeks (based on standard). But in this tests, changed to for 1 week. The time intervals had been used during the reading of test data were as follows (minutes): 0.25, 0.50, 1, 2, 8, 15, 30, 60, 120, 240, 480, 1440, 2880, 4320, 5760, 7200, 8640, and 10080. The number of samples for one location is 6 samples.

There are two relationship curves can be analyzed from consolidation test results. The first curves of the relationship between time and compression. The second curve is the relationship between the void ratio and the logarithmic pressure (e-log p'). Based on the logarithmic curve of time-compression curve methods, the compression parameter of the coefficient of rate of consolidation ($c_v$) is obtained. The methods had been used to obtain the parameter were (1) the square root time method (Taylor's), and (2) the logarithmic time method (Cassagrande's). The compressibility parameters derived from other consolidation tests such as: (a) the beginning of secondary compression ($t_p$), (b) the time of secondary compression ($t_s$), (c) the rate of secondary compression ($c_\alpha$), and (d) compression index ($c_c$).

## 3. Results and discussion

Soil properties testing and peat soil classification have been done in this research. The results of this test were taken from previous researcher. Table 1 presented the average results of index properties, and classification tests from Banyuasin regency. The average water content ($\omega$) obtained from laboratory tests is 258.100 %. The value of average specific gravity ($G_s$) obtained 1.80. The average organic content of peat is found at 78.70 % and the average fiber content 73.60 %. According to Von Post scale, peat soils are classified as fibrous peat. Based on Von Post, the degree of decomposition was $H_4$ scale. While, the classification of peat based on ASTM D 4427-84 is highly acidic. If compared with the results of previous research, all the results of the index properties and classification on peat soils result is still in range of publication data.

**Table 1.** Summary of index properties and classification

| No. | Parameter | Range published data | Average results |
|---|---|---|---|
| 1. | Water Content ($\omega$) | 200-700 % | 258.100 % |
| 2. | Acidity (pH) | 3.0-4.5 | 3.26 |
| 3. | Specific Gravity ($G_s$) | 1.38-1.90 | 1.80 |
| 4. | Dry unit weight ($\gamma_d$) | - | 4.10 kN/m$^3$ |
| 5. | Void Ratio ($e_0$) | 3-15 | 3.22 |
| 6. | Organic Content (OC) | > 80 % | 78.70 % |
| 7. | Fiber Content (FC) | > 20 % | 73.60 % |
| 9. | ASTM D 4427-84 | less than 4.5 | Highly acidic |
| 10. | Von Post | $H_1$- $H_4$ | $H_4$ |

The summary of permeability of peat soil showed in Table 2. And the value of coefficient hydraulic conductivity results from Dusun III Banyu Urip can be seen in Table 3. From the Table 2, the average of hydraulic conductivity coefficients from four locations were 3.76.10-4 cm/sec ($k_v$ 20°)

and 6.13.10-4 cm/sec ($k_h$ 20°). Dusun I Banyu Urip has the highest value pore size that is equal to 1470 nm according to Scanning Electron Microphotograph (SEM) analysis and also has the highest of void ratio value that is 3.445.

Because if pore size is large and void ratio is high then the value of permeability coefficient is high too. Therefore, peat soil classification was categorized having medium hydraulic conductivity. With this behaviour, it can be conclude that peat soil has good drainage. Figure 3 and 4 shows the graph horizontal hydraulic conductivity ($k_v$ and $k_h$) with hydraulic gradient (i).

**Table 2.** The summary of hydraulic conductivity of peat soil

| Parameter (average) | KTM Telang Mulya Sari | Dusun I Banyu Urip | Dusun III Banyu Urip | Desa Gasing Tanjung Api-Api |
|---|---|---|---|---|
| $k_v$ (cm/s)(.$10^{-4}$) | 6,07 | 3,40 | 3,10 | 4,52 |
| $k_v$ (cm/s) 20°C(.$10^{-4}$) | 5,28 | 2,92 | 2,86 | 3,96 |
| $k_h$ (cm/s)(.$10^{-4}$) | 8,40 | 6,68 | 6,80 | 7,04 |
| $k_h$ (cm/s) 20°C(.$10^{-4}$) | 7,07 | 5,69 | 5,86 | 5,91 |

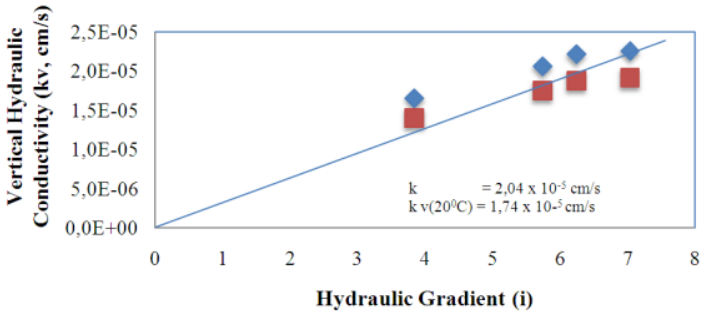



**Figure 3.** Vertical hydraulic conductivity ($k_v$) versus hydraulic gradient (i) from Dusun III Banyu Urip sample

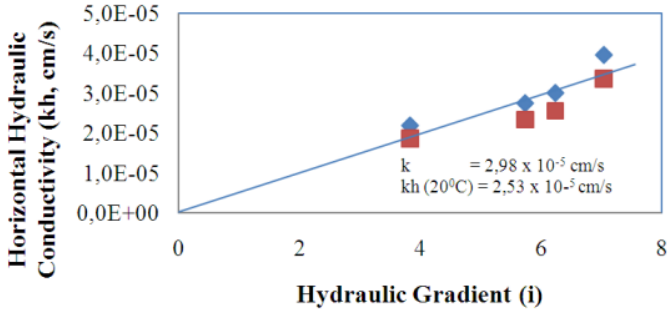



**Figure 4.** Horizontal hydraulic conductivity ($k_h$) versus hydraulic gradient (i) from Dusun III Banyu Urip sample

Based on the research of [7], the values of the coefficient of hydraulic conductivity for biodegraded ($H_4$) peat material was $10^{-9}$-$10^{-10}$ m/s. This result is lower than the value in the field. The calculated hydraulic conductivity coefficient was founded comparative to the effective stress on a logarithmic plot. [5] reported the range of value permeability coefficient were $k_v$= 5.30x10-4-6.24x10-4 cm/sec and and $k_h$= 7.14x10-4-9.93x10-4 cm/sec. The coefficient of permeability based on [14] were k=2.99x$10^{-6}$ cm/sec (depth 6.2-6.4 m) and k=6.88x$10^{-6}$ cm/sec (depth 8.8-9.0 m). The result of permeability coefficient from the present study is greater than previous researcher.

The mechanical characteristics based on consolidation tests had been done using Oedometer test. The standar procedures outlined in ASTM D 2435-96. This test was carried out to establish the preliminary estimation of the possible response of the peat to loading. Typical logarithmic of time compression curve derived from the consolidation test is shown in Figure 5. It can be observed from the figure that the primary consolidation is still dominant in the compression of the peat, but the consolidation occur in relatively shorter time.

Consolidation parameters obtained by using Cassagrande's method based on the time-compression curves were: (a) the end of primary consolidation ($t_p$), (b) the coefficient of secondary compression ($c_{\square}$), (c) the end of secondary compression ($t_s$), and (d) the coefficient of rate of consolidation ($c_v$). The average value of the coefficient of rate of consolidation ($c_v$) for each pressure show in Table 4/

**Table 3.** Hydraulic conductivity results from Dusun III Banyu Urip

| **Parameter** | **H (cm)** | **L (cm)** | **i** | **T (°C)** | **ηT(g/cm.s)** | **Q ($cm^3$)** | **T (s)** | **$k_V$ (cm/s) .10 -4** | **$k_{20}$ (cm/s) .10$^{-4}$** |
|---|---|---|---|---|---|---|---|---|---|
| | 93.5 | 15 | 6.233 | 26 | 0.00874 | 250 | 3578,82 | 2,54 | 2,21 |
| Vertical | 93.5 | 15 | 6.233 | 26 | 0.00874 | 250 | 4116,00 | 2,21 | 1,92 |
| Hydraulic | 93.5 | 15 | 6.233 | 26 | 0.00874 | 250 | 4806,82 | 1,89 | 1,64 |
| Conductivity | 93.5 | 15 | 6.233 | 27 | 0.00855 | 250 | 1843,46 | 4,93 | 4,19 |
| ($k_v$) | 93.5 | 15 | 6.233 | 27 | 0.00855 | 250 | 2006,81 | 4,53 | 3,85 |
| | 93.5 | 15 | 6.233 | 27 | 0.00855 | 250 | 2100,59 | 4,32 | 3,68 |
| **Parameter** | **H (cm)** | **L(cm)** | **i** | **T (°C)** | **ηT(g/cm.s)** | **Q ($cm^3$)** | **T (s)** | **$k_h$ (cm/s) .10 -4** | **$k_{20}$ (cm/s) .10$^{-4}$** |
| | 93.5 | 15 | 6.233 | 27 | 0.00855 | 250 | 566.32 | 1.60 | 1.60 |
| Horizontal | 93.5 | 15 | 6.233 | 27 | 0.00855 | 250 | 2056.24 | 4.42 | 3.76 |
| Hydraulic | 93.5 | 15 | 6.233 | 27 | 0.00855 | 250 | 1564.93 | 5.80 | 4.94 |
| Conductivity | 93.5 | 15 | 6.233 | 26 | 0.00874 | 250 | 1573.15 | 5.77 | 4.91 |
| ($k_h$) | 93.5 | 15 | 6.233 | 26 | 0.00874 | 250 | 2563.00 | 3.54 | 3.01 |
| | 93.5 | 15 | 6.233 | 26 | 0.00874 | 250 | 2006.81 | 4.53 | 3.85 |

**Table 4.** The average value of cv for each pressure

| **Pressure (p', kPa)** | **Rate of consolidation ($c_v$, $m^2$/year)** | | | |
|---|---|---|---|---|
| | **Cassagrande's Method** | | **Taylor's Method** | |
| | **Dusun I Banyu Urip** | **Dusun III Banyu Urip** | **Dusun I Banyu Urip** | **Dusun III Banyu Urip** |
| 50 | 12.260 | 13.671 | 18.048 | 18.098 |
| 100 | 9.725 | 11.511 | 10.271 | 8.615 |
| 200 | 8.425 | 8.268 | 8.911 | 7.226 |
| 400 | 3.522 | 3.312 | 3.318 | 3.086 |

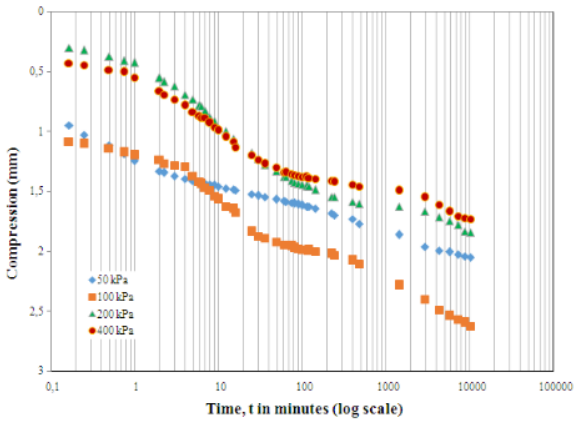



**Figure 5.** Relationship curve between compression-logarithmic of time from consolidation test based on Cassagrande's Method (Dusun III Banyu Urip)

**Table 5.** Results of consolidation test based on Cassagrande's Method

| Parameter | Pressure (p', kPa) | Cassagrande's Method | |
|---|---|---|---|
| | | Dusun I Banyu Urip | Dusun III Banyu Urip |
| End of primary consolidation ($t_{100}$ = $t_p$, minutes) | 50 | 50 | 55 |
| | 100 | 36 | 44 |
| | 200 | 29 | 31 |
| | 400 | 24 | 20 |
| Coefficient of secondary compression (c) | 50 | 0.064 | 0.114 |
| | 100 | 0.135 | 0.212 |
| | 200 | 0.248 | 0.376 |
| | 400 | 0.119 | 0.187 |
| End of secondary compression ($t_s$, minutes) | 50 | 2613 | 4025 |
| | 100 | 2058 | 2825 |
| | 200 | 1800 | 2183 |
| | 400 | 1438 | 1800 |
| Compression Index ($c_c$) | | 1.428 | 1.215 |

Table 5 described the compressibility parameters obtained from consolidation curves. Figure 6 shows the results of analysis based on Cassagrande's method. Figure 7 is an analysis of Taylor's method. Figures 6 and 7 were taken from the location of Dusun III Banyu Urip sample. The coefficient of rate of consolidation ($c_v$, $m^2$/year) based on Cassagrande's method from Dusun III Banyu Urip were 3.671 (50 kPa), 11.511(100 kPa), 8.268 (200 kPa), and 3.312 (400 kPa).

Figure 6 (Cassagrande's method) explains that the [9] had been studying the compressibility parameter. These study about reversed again organic peat soil in Khulna region (Bangladesh). The variation of the coefficient of rate of consolidation ($c_v$) with the increase of applied pressure for varying organic contents was evaluated. The value of coefficient of rate of consolidation ($c_v$) increases: 0.0135 to 0.1200 $cm^2$/s for the organic content of 35 % (consolidation pressure from 25 to 800 kPa). [12] show the results $c_v$ decreases because of increasing consolidation pressure.

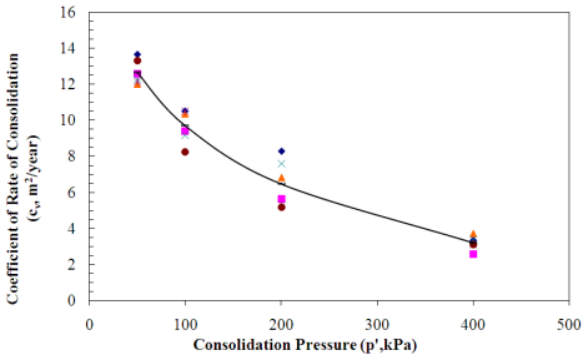



**Figure 6.** Relationship curve between consolidation pressure - coefficient of rate of consolidation based on Cassagrande's Method (Dusun III Banyu Urip)

The value of $t_p$ is decreasing nonlinearly with the consolidation pressure. Beside of that, the average value of this $t_s$ versus pressure based on Table 5, also show the value of this $t_s$ is decreasing with the consolidation pressure. The average compression index ($c_c$) in the Dusun I Banyu Urip 1.428. And the average $c_c$ in the location of Dusun III Banyu Urip is 1.215. The value obtained from the Oedometer test conducted on fibrous peat soil from Banyuasin is slightly lower than published is in the range 6-9 [8]. [10] reported the value of the compression index (cc) was 2.68 for peaty soil from Parit Nipah Darat, Johor. This test uses the undisturbed sample and 1-D Oedometer consolidation tests.

High compression index ($c_c$) values explain that the settlement was also high. The compression index ($c_c$) parameter from consolidation test (Oedometer) has been performed by researchers [11]. The results of this test follow: (a) fibric ($c_c$ = 1,453-3,211), (b) hemic ($c_c$ = 1,290-2,780), and (c) sapric ($c_c$ = 1,150-2,440). Based on the study literature, the range of values for cc is 5-10. Thus if this parameter compared with the study [11], then the $c_c$ result was smaller. The parameters of the coefficient of secondary compression ($c_\square$) were in the range of 0.08-0.09 for fibric, hemic and sapric peat soil. This range of values explains that at the time of the consolidation process, peat soil has high secondary compressibility.

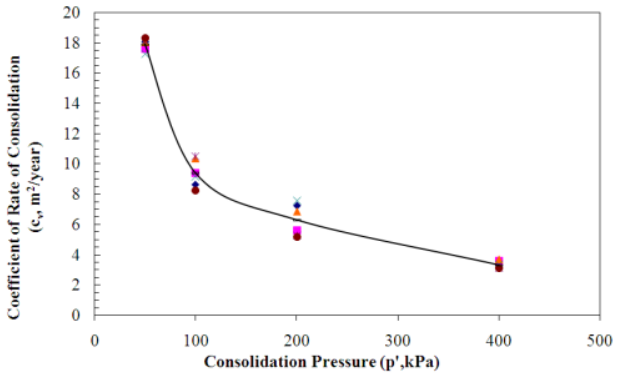
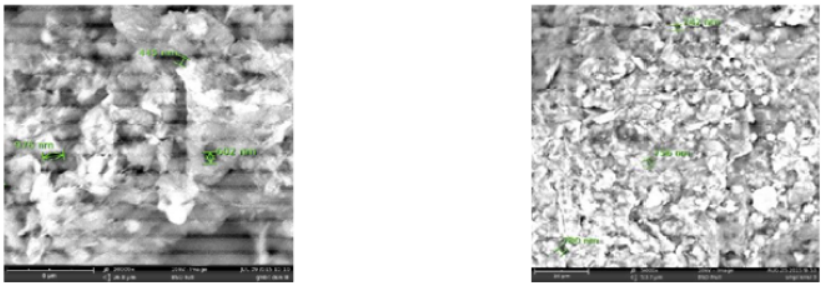



**Figure 7.** Relationship curve between consolidation pressure - coefficient of rate of consolidation based on Taylor's Method (Dusun III Banyu Urip)

Fiber orientation is identified as a principal factor is the structure of fibrous peat. The existence of the fiber induces the peat soil imperfections such as: rootlets, pockets, cracks, and fissures of organic material which may result in higher initial hydraulic conductivity/permeability of the peat soil. The

function of consolidation pressure may encourage a rearrangement of fiber orientation of peat soil drastically reduces the void, causing a significant reduction in the vertical permeability.

Figure 8 shows the results of Scanning Electron Microphotograph (SEM). This result based on consolidation pressure before and after test. The fibrous peat soil sample was taken from Dusun III Banyu Urip. From Figure 8 it can be seen that there are differences in SEM results before and after the test. Before the test, the arrangement of fiber from peat soil was larger. When compared after the test, the pores on the fibrous peat soil become more closely. [3] concluded that compressibility of peat soil can be influenced by the soil consist (macropores and micropores) in the photomicrographs of the peat soil. Also, SEM images based on [13] show uninterrupted peat soils with fibrous structure characteristics and coarse organic particles.



(a) Before (b) After

**Figure 8.** Results of analysis of SEM under consolidation pressure (a) Before test and (b) After test

Compressibility characteristic be related with hydraulic conductivity characteristics. Based on the result of consolidation test, the coefficient of hydraulic conductivity in vertical direction ($k_v$) was obtained. Table 6 shows the results of the $k_v$ parameters below the 50 kPa-400 kPa pressure range. The relationship between pressure giving and the vertical coefficient of hydraulic conductivity was described in Figure 9. The applied of pressure on the consolidation test affected the results of the $k_v$ values.

**Table 6.** Average value coefficient of vertical hydraulic conductivity for each consolidation pressure

| Parameter | Pressure (p', kPa) | Dusun I Banyu Urip | Dusun III Banyu Urip |
|---|---|---|---|
| Coefficient of volume compressibility ($m_v$, 1/kPa) | 50 | 0,0026233 | 0,0034000 |
| | 100 | 0,0015133 | 0,0022967 |
| | 200 | 0,0004733 | 0,0002633 |
| | 400 | 0,0004467 | 0,000170 |
| Coefficient of Vertical Hydraulic Conductivity ($k_v$ , cm/s) | 50 | $1,07.10^{-9}$ | $1,37.10^{-9}$ |
| | 100 | $4,86.10^{-10}$ | $7,03.10^{-10}$ |
| | 200 | $1,04.10^{-10}$ | $4,63.10^{-11}$ |
| | 400 | $4,44.10^{-10}$ | $1,69.10^{-11}$ |

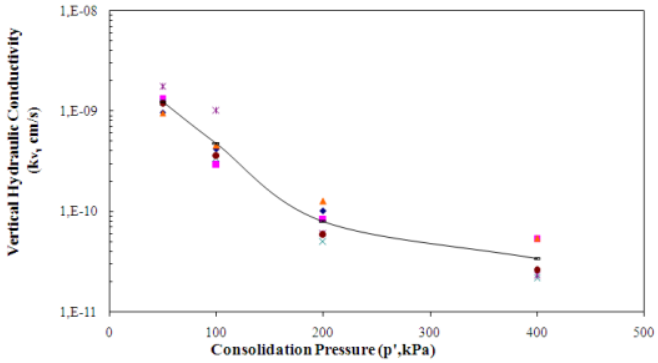



**Figure 9.** Variation coefficient of vertical hydraulic conductivity with consolidation pressure (Dusun III Banyu Urip)

It can be seen from the Table 6 the average value coefficient of vertical hydraulic conductivity ($k_v$) under consolidation pressure 50 kPa are 1,07.10-9 cm/s (Dusun I Banyu Urip) and 1,37.10-9 cm/s (Dusun III Banyu Urip). The value of hydraulic conductivity in vertical direction ($k_v$) of Figure 9 appears to decrease. This is a result of pressure (p', kPa) of 50, 100, 200, and 400. So it can be concluded that the greater the pressure value (p'), the $k_v$ value obtained will be smaller.

## 4. Conclusion

The hydraulic conductivity/permeability and compressibility of fibrous peat soil affected by the behaviour of fibrous peat soil as: (a) depth, (b) water content, (c) void ratio, and (d) classification. The peat soil in Banyuasin Regency was categorized as fibrous peat soil. This research gave the information that the peat soil is one of the typical peat soil, which is can be found in South Sumatera.

Based on hydraulic conductivity test (Constant Head method), the average coefficient vertical hydraulic conductivity coefficient ($k_v$ 20°) was 3.76.10-4 cm/s. And the average coefficient of the horizontal hydraulic conductivity coefficient (kh 20o) was 6.13.10-4 cm/s. Results show that the ratio of $k_h/k_v$ (20°C) was 2.04 (Dusun III Banyu Urip). The value of horizontal coefficient hydraulic conductivity (kh) is more than the value of vertical coefficient hydraulic conductivity ($k_v$). This is because in the horizontal direction, peat soil has a larger pore size.

The hydraulic conductivity/permeability parameters also obtained from consolidation test. The average value coefficient of vertical hydraulic conductivity ($k_v$) from Dusun I Banyu Urip was 1,07.10-9 cm/s (for consolidation pressure 50 kPa).

The analysis of compressibility characteristics of fibrous peat soil had been done using Oedometer test. The results from consolidation test were the average compression index ($c_c$) in the Dusun I Banyu Urip 1.428 and the average compression index ($c_c$) on the location of Dusun III Banyu Urip is 1.215. The coefficient of rate of consolidation ($c_v$) based on Cassagrande's method from 13.671 from 3.312 under consolidation pressure in range of 50 to 200 kPa (Dusun III Banyu Urip).

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## 6. References

[1] Sarki, S , et al , Determination of Saturated Hydraulic Conductivity of Different Soil Texture Materials IOSR Journal of Agriculture and Veterinary Science (IOSR-JAVS) e-ISSN: 2319-2380, p-ISSN: 2319-2372 Volume 7, Issue 12 Ver IV (December), PP 56-62 2-014

[2] Huat, B B K , Organic and Peat Soils Engineering, Universiti Putra Malaysia Press, Serdang Malaysia, 2004

[3] Wong, L , S , Hashim, R , and Ali, F , H , A Review on Hydraulic Conductivuty and Compressibility of Peat, Journal of Applied Sciences 9(18):3207-3218, 2009

[4] Huat B , B , K , et al , State of an Art Review of Peat: General Perspective International Journal of the Physical Sciences Vol 6(8), pp 1988-1996, 18 April, 2011

[5] Sutejo, Y et al , Engineering Properties of Peat in Ogan Ilir Regency Jurnal Teknologi (Sciences and Engineering) 78: 7–3 (2016) 61–69 2016

[6] Yulindasari S 2006 Compressibility Characteristics of Fibrous Peat Soil Master Thesis, Universiti Teknologi Malaysia (UTM), Malaysia

[7] Kelly, B , C , O , and Pichan, S , P , Effect of decomposition on The Compressibility of Fibrous Peat-A Review, Geomechanics and Geoengineering:An International Jurnal, 2013

[8] Ajlouni, M A Geotechnical Properties of Peat and Related Engineering Problems Thesis University of Illinois at Urbana-Champaign 2000

[9] Rabbee T , and Rafizul, I , M , Strength and Compressibility Characteristics of Reconstituted Organic Soil at Khulna Region of Bangladesh International Journal of Engineering and Technology Volume 2 No 10, October, 2012

[10] Johari, N , N , Bakar, I , Razali, S , N , M , and Wahab, N , Fiber Effects on Compressibility of Peat, Soft Soil Engineering International Conference 2015 (SEIC2015), Materials Science and Engineering 136 2016

[11] Duraisamy Y , et al , Engineering Properties and Compressibility Behavior of Tropical Peat Soil. American Journal of Applied Sciences 4 (10): 768-773, 2007

[12] Gofar, N , and Sutejo, Y , Long Term Compression Behavior of Fibrous Peat of Civil Engineering 19(2):1-15 2007

[13] Ali F H , et al , Engineering Properties of Improved Fibrous Peat Scientific Research and Essay Vol 5 (2), pp 154-169 2010

[14] Wang, M , et al , Experiment Study on Permeability of Solidified Dianchi Peaty Soil MATEC Web pf Conferences 22, 04010 2015

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