

Proposed by S. Charoenpong, 1974
Revised by :
P. Vijarnsorn and staffs, 1988
W. Sirichuaychoo, 2004

KHAO KHAT SERIES

Field Symbol: Kkt

Distribution: Occupies moderate extent in Peninsular Thailand and some areas in Southeast Coast of Thailand.

Setting: Khao Khat soils derived from fine grain clastic rocks namely shale, phyllite or equivalent rocks and occurred on denudation surface. Relief is gently undulating to undulating with slopes range from 12 percent. Elevation ranges from 20 to 50 m above mean sea level. The climate is Tropical Rain Forest (Koppen 'Af') or Tropical Monsoon (Koppen 'Am'). Average precipitation is above 2,000 mm. Average annual air temperature is from 26 °C to 28 °C.

Drainage, Permeability and Surface Runoff: Drainage is well to moderately well drained, permeability is estimated to be moderate an surface runoff is medium. Ground water level lies below 1.5 m throughout the year.

Vegetation and Land Use: Mostly used for para rubber and oil palm.

Characteristic Profile Features: The Khao Khat series is a member of the clayey-skeletal, kaolinitic, isohyperthermic Typic (Kandic) Plinthudults (soil taxonomy, 2003). They are shallow soils to ironstones and are characterized by a very dark grayish brown to brown loam surface or A horizon overlying a brownish or yellowish very gravelly clay loam to clay kandic B horizon. These in turn overly a mixed yellowish and/or brownish and reddish clay kandic B, BC or C horizon which occur approximately between 60 to 125 cm from the soil surface (normally within 150 cm from the soil surface) and accompany with plinthite that forms a continuous phase or constitutes more than half of the matrix. Very strongly acid to strongly acid, reaction values range from 4.5 to 5.5 throughout the profile.

Typifying Pedon: Khao Khat loam - Ban Tang Yang, Tambon Sakom, Amphoe Muang, Changwat Satun, 5 to 6 percent slopes (sheet number 4992 I SE).

Profile Code Number: S-67/113, described by Prasat Rimchala, 14 May 1974 (moist colors unless otherwise stated).

Horizon Depth (cm)	Description
A 0-9	Dark brown to brown (10YR3/3) loam; moderate fine to medium subangular blocky structure; friable, nonstick and, nonplastic; many fine and common medium roots; strongly acid (field pH 5.5); clear smooth boundary.
Bw 9-21	Yellowish brown (10YR5/6) and strong brown (7.5YR5/6) slightly gravelly loam; weak fine to medium subangular blocky structure; friable, nonsticky and nonplastic; many fine and few medium roots; gravels composed of ironstone size 0.2-1.0 cm (round and subrounded shape); strongly acid (field pH 5.5); gradual smooth boundary.
Btc1 21-43	Strong brown (7.5YR5/8) and yellowish red (5YR5/8) very gravelly clay; unobserved structure; sticky and plastic; common moderately thick cutan on ped faces; many fine roots; gravels composed of ironstone size 0.2-1.0 cm (round and subrounded shape); strongly acid (field pH 5.5); gradual smooth boundary.
Btc2 43-75	Yellowish red (5YR5/8) and strong brown (7.5YR5/8) very gravelly clay; unobserved structure; sticky and plastic; common moderately thick cutan on ped faces; common fine roots; gravels composed of ironstone size 0.2-2.0 cm (round and subrounded shape); slightly acid (field pH 5.5); diffuse smooth boundary.

BCv 75-120 Red (10R5/8), strong brown (7.5YR5/8), yellowish brown (10YR5/8) and yellow (10YR7/8) clay; Plinthite more than 50% by volume of the soil matrix or continuous phase.

Type Location:

Name of village, Ban Khao Khat, Amphoe La-ngu, Changwat Satun.

Range of Profile Features:

The surface or A horizon loam or clay loam, is 10 to 15 cm in thickness and has 10YR or 7.5YR hues, values 3 to 5 and chromas 2 or 3. Gravels of ironstones may be present. Structure is weak fine and medium subangular blocky. Very strongly acid to moderately acid, reaction values range from 5.0 to 6.0.

The upper kandic B horizon very gravelly clay loam to very gravelly clay, has 10YR or 7.5YR hues, values 5 or 6 and chromas 6 or 8. These colors may mixed with reddish color. Gravels are ironstones which composed of more than 35 percent by volume of the soil matrix within 50 cm from the soil surface. Structure is hard to describe due to the presence of ironstones.

The lower kandic B, BC or C horizon slightly gravelly clay, has a mixed color of brownish, yellowish (10YR or 7.5YR hues, values 5 to 6 and chromas 6 to 8) and reddish of plinthite (2.5YR or 10R). These horizons usually within 150 cm from the soil surface. Structure is weak and moderate fine and medium subangular blocky structure. Very strongly acid to strongly acid, reaction values range from 4.5 to 5.5.

Similar Soil series:

Tha Chang series (Tac): loamy-skeletal, kaolinitic, isohyperthermic Typic (Kandic) Plinthudults.

Khlong Chak series (Kc): clayey-skeletal, kaolinitic, isohyperthermic Typic Kandihumults, has not mottles clay within 150 cm from the soil surface.

Principal Associated Soils:

These include Khlong Teng, Na Thon and Pak Chan series.

Khlong Teng series (Klt): fine-loamy, mixed, semiactive, isohyperthermic Typic Haplohumults, bed rock within 50 cm from the soil surface.

Na Thon series (Ntn): fine, kaolinitic, isohyperthermic, shallow Typic Haplohumults, bed rock between 50 to 100 cm from the soil surface.

Pak Chan series (Pac): very fine, kaolinitic, isohyperthermic Typic Palehumults, has mixed colors of weathered bed rock within 150 cm from the soil surface.

ANALYSIS RESULTS
(oven dry basis)

Profile code No.: S-67/113
Soil series: Khao Khat series (Kkt)

Lab No.	Depth (cm)	Horizon	Particle size distribution analysis (% by weight)								Texture		pH		CaCO ₃ %	P, mg kg ⁻¹ Bray 2	K, mg kg ⁻¹ NH ₄ OAc	
			USDA grading			Sand-fraction grading					Lab	Field	1:1 water	1:1 KCl				
			sand	silt	clay	vc	c	m	f	vf	result	estim ⁿ						
Pe-984	0-9	A	43.5	40.0	16.5							l	l	5.1	4.3	0.3	1.7	120
Pe-985	9-21	Bw	42.5	28.0	29.5							cl	sli.gl	5.1	4.0	0.3	1.2	41
Pe-986	21-43	Btc1	36.5	18.0	45.5							c	vgc	5.4	4.1	0.6	1.6	41
Pe-987	43-75	Btc2	36.0	25.0	39.0							cl	vgc	5.7	4.1	0.9	1.6	29
Pe-988	75-120	BCv	24.0	31.5	44.5							c	c	5.5	4.0	0.6	1.4	29

Depth (cm)	Air dried to oven dried	C %	N %	Exchange capacity and cations (cmol ₍₊₎ kg ⁻¹)										Base satur ⁿ (%)		ECEC cmol ₍₊₎ kg ⁻¹ (B+D)	Al KCl extr. cmol ₍₊₎ kg ⁻¹ (D)	Electrical conduct ^y (ECx10 ⁶) dS m ⁻¹
				Ca	Mg	K	Na	SUM cations (B)	Extr. acidity (A)	SUM (B+A)	CEC NH ₄ OAc (C)	CEC 100g Clay	B/Cx100	(Bx100)/(B+A)				
0-9	5.6	2.21		1.50	0.90	0.30	0.30	3.00	9.10	12.10	7.3	44.2	41	25			0.24	
9-21	1.3	1.13		0.80	0.30	0.10	0.30	1.50	9.10	10.60	6.1	20.7	25	14			0.04	
21-43	2.7	0.79		0.90	0.30	0.10	0.30	1.60	10.30	11.90	8.1	17.8	20	13			0.02	
43-75	2.1	0.41		0.40	0.20	0.10	0.60	1.30	9.50	10.80	6.2	15.9	21	12			0.01	
75-120	2.1	0.29		0.20	0.20	0.10	0.30	0.80	10.10	10.90	6.2	13.9	13	7			0.02	

Surveyor: P. Rimchala
Date: May 14, 1974

Reported by: W. Sirichuychoo
Date: Nov. 20, 1998