

Taxonomic Study on Nine Species of Orchids in Pein Chit Reserved Forest of Loilin Lay Township, Loikaw District, Kayah State

Ei Ei Moe*, Win Naing **, Soe Myint Aye ***

Abstract

The present research deals with a taxonomic study on family Orchidaceae in Pein Chit Reserved Forest, Loikaw District, Kayah State. The study feature was presented by nine species belonging to six genera of family Orchidaceae. There were two terrestrials and seven epiphytic species. *Paphiopedilum bellatulum* (Reichb.f.) Stein and *Pholidota articulata* Lindl are terrestrial plants, *Eria acervata* Lindl., *E. amica* Rchb. f., *E. pubescens* Wight., *Gastrochilus calceolaris* (Buch.Ham.exSm.)D.Don., *Geodorum citrinum* Jacks., *Ornithochilus difformis* (Wall.ex.Lindl) Schltr. and *Paphiopedilum parishii* (Reichb.f.) Stein are epiphytes. The collected nine species were identified and classified. An artificial key of the studied plants and description of plants were also mentioned for easy identification. The research will provide the valuable information on resources of orchid species in Kayah State.

Keywords: Taxonomic study, Orchidaceae, terrestrials, epiphytic.

Introduction

The selected area is chosen in Pein chit reserved forest of Loilin Lay Township, Loikaw District in Kayah State, which is located about 3 miles away from the Western part of the Htee Se Khar waterfall and it is the side of Nant Thabak Chaung. The study area is situated between North Latitude 19°52' to 19°55' and East Longitude 97°12' to 97°17', 899 m above the Sea level in elevation of Loilin lay Township area. This area has in the monsoon and savannah climates. The climate condition of this area is divided into rainy and dry seasons.

Orchids are one of the most striking, elegant, glamorous flowers to be found in nature and it is very interesting. They are widely distributed throughout the country. About 50% of the rain forest covering the world had been destroyed by human activities and the orchid population is at risk of extinction due to their habitat destruction.

Orchids may be identified into the following floral characteristics: (i) The sexual organs of the flowers (stamens and stigma) are combined into a single structure called the column. (ii) The anthers are decreased in number to one or two and the pollen are massed into waxy structures known as pollinia. (iii) One of the petals has developed into a highly complex "labellum". (iv) The ovary is inferior and is generally twisted through over 160 degrees.

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The aim and objectives of the study are to investigate the natural Orchid species from Pein Chit Reserved Forest area, to record their distribution and morphological characteristics, and to get the valuable information of Orchid species from the study area.

Materials and Methods

The specimens were collected from Pein Chit Reserved Forest of Loilinlay Township, Loikaw District, Kayah State during 2017-2020. The morphological characters of vegetative and reproductive parts were recorded. The specimens were prepared and preserved based on the herbarium techniques of Lawrence (1964). Then, the herbarium specimens were deposited in Herbarium of Mandalay University for references and other researchers. The collected plant specimens were identified based on Qi-ming and De-Lin (2007-2009), and Wu *et al.*, (2009), Bartle (1966), Chen *et al.*, (2009) and Seidenfaden (1992).

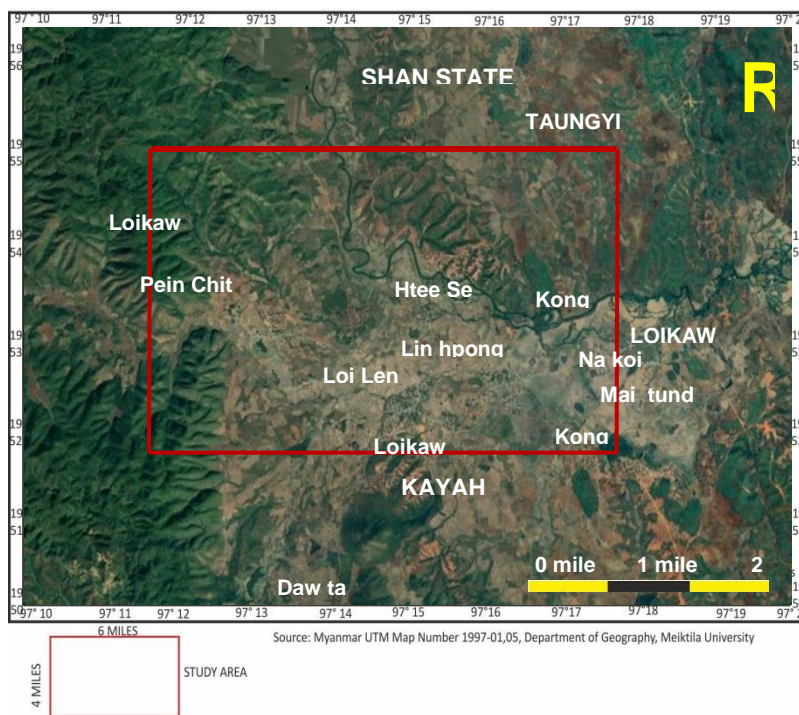


Figure 1. Location map of Pein Chit Reserved Forest Area in Kayah State

Results

The collected nine species belonging to six genera of family Orchidaceae were classified according to Byng *et al.*, (2016). The collected species were shown in Table 1.

Table 1. List of the collected species from Pein Chit Reserved Forest of Loikaw District, Kayah State

Class	Order	Family	Scientific Name
1.Monocots	1.Asparagales	1.Orchidaceae	1. <i>Eria acervata</i> Lindl.
			2. <i>Eria amica</i> Rchb.f.
			3. <i>Eria pubescens</i> Wight.
			4. <i>Gastrochilus calceolaris</i> (Buch. –Ham. ex Sm) D. Don
			5. <i>Geodorum citrinum</i> Jacks.
			6. <i>Ornithochilus difformis</i> (Wall. ex Lindl.) Schltr.
			7. <i>Paphiopedilum bellatulum</i> (Reichb.f.) Stein.
			8. <i>Paphiopedilum parishii</i> (Reichb. f.) Stein.
			9. <i>Pholidota articulata</i> Lindl.



Figure 1. *Eria acervata* Lindl.

A. Habit B. L.S of flower C. Pollinia D. T.S of ovary



Figure 2. *Eria amica* Rchb.f.

A. Habit B. L.S of flower C. Pollinia D. T.S of ovary



Figure 3. *Eria pubescens* Wight.

A. Habit B. L.S of flower C. Pollinia D. T.S of ovary

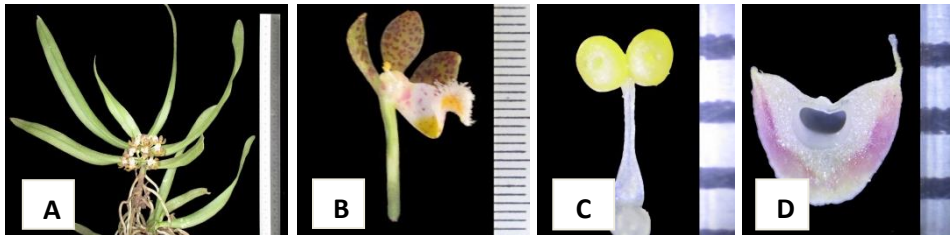


Figure 4. *Gastrochilus calceolaris* (Buch.Ham.exSm.)D.Don.

A. Habit B. L.S of flower C. Pollinia D. T.S of ovary

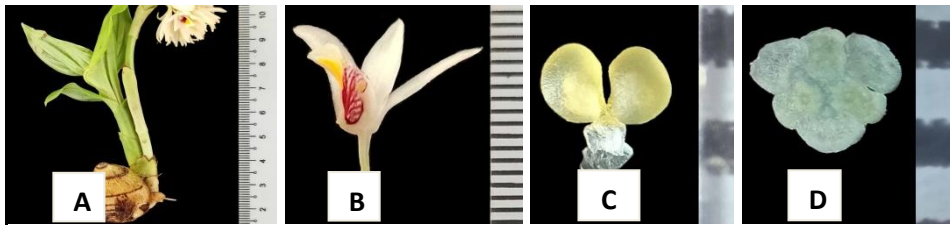


Figure 5. *Geodorum citrinum* Jacks.

A. Habit B. L.S of flower C. Pollinia D. T.S of ovary



Figure 6. *Ornithochilus difformis* (Wall.ex.Lindl) Schltr.,

A. Habit B. L.S of flower C. Pollinia D. T.S of ovary



Figure 7. *Paphiopedilium bellatulum* (Reichb.f.) Stein

A. Habit B. L.S of flower C. Pollinia D. T.S of ovary

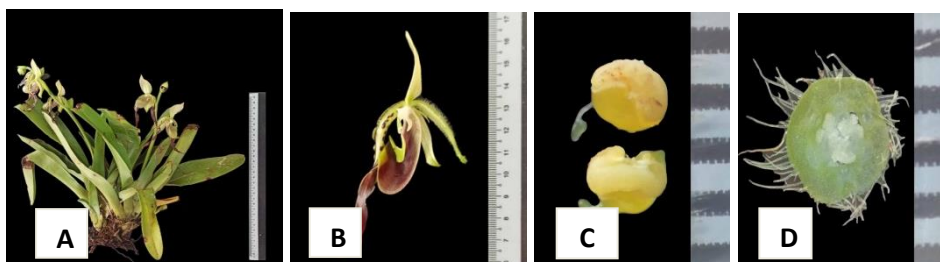
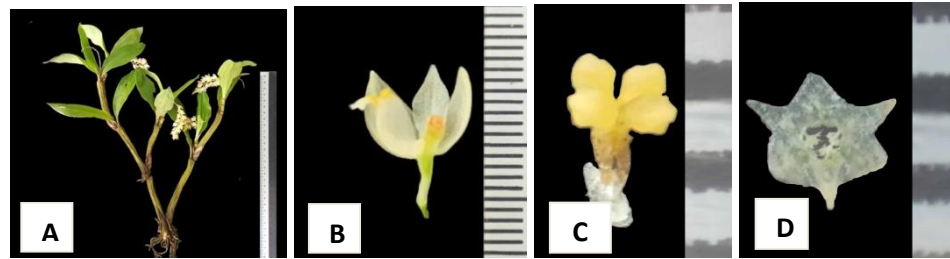


Figure 8. *Paphiopedilum parishii* (Reichb.f.) Stein

A. Habit B. L.S of flower C. Pollinia D. T.S of ovary

Figure 9. *Pholidota articulata* Lindl

A. Habit

B. L.S of flower

C. Pollinia

D. T.S of ovary

1. *Eria acervata* Lindl., J. Hort. Soc. London. 6: 57, f. pg. 58. 1851. (Fig.1)

Local Name : Pyar thazin

Flowering period : April to June

Sympodial epiphytes. Roots clinging, cylindrical, white, glabrous. Pseudobulbs 3- to 4-jointed, erect, ellipsoid to oblongoid, flattened, pale green, glabrous. Leaves simple, alternate, oblong lanceolate, green. Inflorescences axillary racemes, erect, few-flowered; peduncles slender, pale green; peduncular bracts 2-3, sheathing, persistent, green; floral bracts ovate-lanceolate, large, yellow. Flowers bisexual, zygomorphic, epigynous, creamy white; pedicels slender, creamy white; dorsal sepals lanceolate, creamy white; lateral petals lanceolate, creamy white; labellum obovate, distinctly 3-lobed, with median ridges, creamy white, midlobes, creamy white; column short, creamy white with violet tip, column foot violet within and creamy white without; anthercaps ovoid, creamy white; pollinia 8, ovoid, yellow; stigmatic surfaces quadrangular, creamy white. Carpel 3, fused; ovary inferior.

2. *Eria amica* Rchb.f., Xenia. Orchiid. 2: 162. Pl. 168, f. 3(6-9) 1870. (Fig.2)

Local Name : Nat tha mee pan myo kywe

Flowering period : February to May

Sympodial epiphytes. Roots clinging, cylindrical, glabrous, brownish-white. Pseudobulbs 2- 3- jointed, erect, cylindrical, oblong, yellowish green, basal sheaths absent. Leaves simple, oblong, persistent, deep green above and paler beneath. Inflorescences axillary racemes, erect, 1- 2 on each pseudobulb, 9-10- flowered; peduncles short, slender, green; peduncular bracts 3, oblong-lanceolate, deciduous, yellowish green; floral bracts ovate-oblong, yellowish green. Flowers bisexual, zygomorphic, epigynous, pale yellow with reddish-purple veins; pedicels long, yellowish green; the dorsal sepals broadly oblong, pale yellow with reddish-purple veins; petals linear-lanceolate, pale yellow with reddish purple veins; the labellum ovate, attached to the column-foot, distinctly 3-lobed, the mid lobe obcordate, pale yellow with 3- reddish purple ridges on the disc; spur saccate, yellow; column long, slender, the column-foot short; anthercaps sub-globose; the pollinia 8, in 1 group of 8, yellow, waxy, the caudicle absent, the viscidium minute, the rostellum obscured, the stigmatic surfaces oblong, shining. Carpel 3, united; ovary inferior.

3. *Eria pubescens* Wight., Icon. Pl. Ind. Irient. 5: 1: t. 1634. 1852. (Fig.3)

Local Name : Kadibar

Flowering periods : February to May

Sympodial epiphytes. Roots clinging, white, glabrous. Pseudobulbs one-jointed, erect, ovate, green. Leaves simple, ovate-lanceolate, 2 leaves per pseudobulbs, thickening, green above and pale green beneath. Inflorescences basal racemes, erect, 5- to 7-flowered; peduncles slender, cylindrical, short, green, tomentose white; peduncular bracts 4-5, ovate-lanceolate, yellowish green, tomentose white; floral bracts narrowly ovate, brown, tomentose white. Flowers bisexual, zygomorphic, epigynous, yellowish green, central brown and yellowish green margins of lip; pedicel long, yellowish green, tomentose white; dorsal sepal narrowly triangular, reddish brown streaks and yellowish green; lateral petal linear-oblong, yellowish green; labellum 3-lobed, yellowish purple marking on the disk of the lip; midlobe orbicular, central brown and margins yellowish green; spur obscure; column short, straight, white; anthercaps subglobose, white, glabrous; pollinia 8, ovoid compressed, 1 groups of 8, waxy, yellow, caudicle absent; viscidium minute; stigmatic surface minute. Carpels 3, united; ovary inferior.

4. *Gastrochilus calceolaris* (Buch. -Ham. ex Sm.) D. Don, Prodr. Fl. Nep. 32.1825. (Fig.4)

Myanmar name : Kyet tu yway pan

Flowering period : January to February

Monopodial epiphytes. Roots long, drooping, clinging, cylindrical, white. Stems leafy, erect, cylindrical, short, green. Leaves alternate and distichous, oblong-lanceolate, coriaceous, dark green above and pale green beneath. Inflorescences short, axillary racemes, 2-4 flowered; peduncle short, slender, brownish green. Flower greenish brown sepals and petals with brown spots, white lip with reddish brown dots on yellow centre; floral bracts ovate lanceolate, pale green; pedicels slender, pale yellow; dorsal sepal ovate-lanceolate, greenish brown with reddish brown spots; lateral petals oblong-lanceolate, concave, greenish yellow with reddish brown spots; the labellum triangular, attached to the base of the column, distinctly 3-lobed, the lateral lobes ovate, meeting at the base of midlobes, white, semicircular, yellow centre part; spur absent; column short, yellow; column-foot absent; anthercap ovoid, white; pollinia 2, globose, waxy, yellow; caudicles short. Carpel 3, united; ovary narrowly oblongoid.

5. *Geodorum citrinum* Jacks., Bot. Repos. 626. 1802. (Fig.5)

Local Name : Myae sike

Flowering period : May to June

Sympodial terrestrials. Roots fibrous, thick, white, glabrous. Rhizomes tuberous, thickened, brownish white, glabrous. Leaves spiral, sessile, elliptic-lanceolate, plicate, coriaceous, basal small leaves and above larger leaves, green. Inflorescences basal racemes, erect, drooping, 15-16 flowered; peduncle slender, green; peduncular bract 3, base sheathing, ovate-

lanceolate, green; floral bracts ovate-lanceolate, white. Flowers bisexual, zygomorphic, epigynous, pale yellow sepal and petal with reddish brown streak lip; pedicel slender, pale yellow; dorsal sepal linear-lanceolate, pale yellow; labellum distinctly 3 lobed, cymbiform, midlobe lanceolate, reddish brown streak with yellow; basal spur present, saccate, pale yellow; column short, white; column-foot absent; anthercap sub-globose, white; pollinia 2, sub-globose; stipes short, yellow; stigmatic surfaces sub-orbicular. carpels 3; ovary inferior.

6. *Ornithochilus difformis* (Wall. ex Lindl.) Schltr., Repert. Spec. Nov. Regni Veg. Beih. 4: 277. 1919.

(Fig.6)

Local Name : Unknown

Flowering periods : June to August

Monopodial epiphytes. Roots long dropping, glabrous. Stems very short, leafy, erect, cylindrical, slightly flattened, invested the leaf sheath, greens. Leaves 2 to 3, alternate and distichous, obovate-elliptic, glabrous on both surfaces. Inflorescences axillary racemes, more or less dropping, 1 to 3 on each stem, 20 to 35 flowered, peduncle terete; peduncular bracts 3, broadly-triangular, pale green; floral bracts lanceolate to triangular, pale brown. Flowers bisexual, zygomorphic, epigynous, yellow with thick reddish brown stripe; pedicels yellowish green; dorsal sepals oblong, yellow with thick reddish brown stripes; lateral petals linear, yellow with red stripes; labellum distinctly 3-lobed, yellow with reddish brown middle and yellow tips; spur short, incurved; the column short, pale yellow tinged with reddish purple; anthercaps subglobose, white; pollinia 2, sub-globose, yellow; viscidium obtriangular; stigmatic surfaces obovate, reddish purple. Carpels 3; ovary inferior.

7. *Paphiopedilum bellatulum* (Reichb. f.) Stein., Orchideenbuch, 456. 1892. (Fig.7)

Local Name : Khun mya san; Kya gamon

Flowering periods : February to July

Sympodial terrestrial. Roots thick and spreading, white, glabrous. Stem leafy, dwarf, erect, green. Leaves alternate and distichous; blades elliptic-oblong, dark brown and pale green above and dull purple beneath. Inflorescences terminal racemes, erect, solitary, 1 to 2 flowered; peduncles long, reddish purple; peduncular bracts absent; floral bracts ovate lanceolate, pale green, purple spots within and without. Flowers bisexual, zygomorphic, epigynous, creamy white with brownish purple spots, waxy; pedicel slender, purple, pubescent; dorsal sepals suborbicular, very concave; synsepalum orbiculate concave, nearly as long as the dorsal sepals; petals broadly ovate, sparsely recurved; labellum trilobed, adnate slightly beneath the column; midlobes pouch-like, pouch-parts tapering to a point, claw short, creamy white with brownish purple spots, basally puberulous; spur absent; column short, stout, bent downwards, white, purple spotted dorsally; column foot absent; anthers 2, long, pollen not forming pollinia; stigmatic surfaces V-shaped, white; carpels 3; ovary inferior.

8. *Paphiopedilum parishii* (Reichb. f.) Stein., Orchideenbuch, 479. 1892. (Fig.8)

Local Name : Zawgyi moke seik

Flowering periods : February to July

Sympodial epiphytes. Roots clinging, stout, fibrous, brown. Stems leafy, dwarf, erect, green. Leaves alternate and distichous; blades narrowly elliptic, carinate beneath, thickly leathery, dark green above and yellowish green beneath. Inflorescences terminal raceme, suberect, 3-5 flowered; peduncles long, green, densely white pubescent; peduncular bracts absent; floral bracts broadly ovate-elliptic, green. Flowers bisexual, zygomorphic, epigynous, yellowish green to greenish with darker veins; pedicels slender, green, pubescent. Dorsal sepals ovate-elliptic, glabrous within and puberulous without; Petals linear-lanceolate, margins undulate in basal half, tips rounded, pendulous, strongly twisted, with a few blackish warts along lower and upper margin; labellum trilobed, adnate slightly smooth the column; midlobes pouch-like, pointed at the apex, greenish yellow with darker stripes; spur absent; column short, stout, white, column foot absent; anther 2, obovate, rostellum prominent, pollen not forming pollinia; stigmatic surface V-shaped, white. Carpels 3; ovary inferior.

9. *Pholidota articulata* Lindl., Gen. Sp. Orchid. Pl. 38.1830. (Fig.9)

Local Name : Kwyet meen pan myo Kywe

Flowering periods : May to June

Sympodial epiphyte. Roots fibrous, clinging, cylindrical, brownish white. Pseudobulbs one-jointed, erect, subtetragonal, yellowish green. Leaves alternate and distichous; blades oblanceolate to oblong-lanceolate, two leaves per pseudobulb. Inflorescences basal racemes, pendulous 1 on each pseudobulb, many flowered; peduncles long, pale green. Flowers bisexual, zygomorphic, epigynous, creamy white with light pink, basal part of the labellum yellow; pedicels slender, pale green; peduncular bracts 3-4, ovate to lanceolate, brownish green; floral bracts cymbiform, many veined, creamy white to brownish white; dorsal sepals broadly ovate, creamy white to pinkish white; lateral petals elliptic oblong, white with light pink; labellum cymbiform, attached to the base of the column, distinctly 3-lobed; midlobes recurved, entire, tips obtuse, 2-lobed with yellow blotch; column very short, white; column foot absent; anthercaps subglobose, white tinged with brown; Pollinia 4, subglobose, 1 group of 4, yellow, waxy; stigmatic surfaces oblong, white. Carpels 3; ovary inferior.

An Artificial Key to the Studied Species (Orchids)

1. Plants terrestrial ----- 2
1. Plants epiphyte or lithophyte ----- 3
 2. Inflorescences basal racemes; dorsal sepal linear-lanceolate -----5. *Geodorum citrinum*
 2. Inflorescences terminal racemes; dorsal sepal suborbicular --- 7. *Paphiopedilum bellatum*

- 3. Plant monopodial ----- 4
- 3. Plant sympodial ----- 5
 - 4. Spur present; lateral petal linear ----- 6. *Ornithochilus difformis*
 - 4. Spur absent; lateral petal oblong-lanceolate ----- 4. *Gastrochilus calccolaris*
- 5. Pollinia present ----- 6
- 5. Pollinia absent ----- 8. *Paphiopedilum parishii*
 - 6. Pollinia 4 ----- 9. *Pholidota articulata*
 - 6. Pollinia 8 ----- 7
- 7. Pseudobulb 1-jointed; inflorescences basal racemes ----- 3. *Eria pubescens*
- 7. Pseudobulb 2 to many; inflorescences axillary racemes ----- 8
 - 8. Flower creamy white; anthercaps ovoid ----- 1. *Eria acervata*
 - 8. Flower pale yellow; anthercaps subglobose ----- 2. *Eria amica*

Discussion and Conclusion

Orchidaceae is a large family of flowering plants and extensively distributed, most common in moist tropical forests, dispersed in subtropical and temperate regions and consists of about 788 genera and 18500 species according to Gurcharan Singh (2010). Kress *et al.*, (2003) recorded that 133 genera and 739 species of Orchidaceae were found in Myanmar. In the present study, 9 species belonging to 6 genera were recorded from the selected area. The distinctive features of this family are the presence of zygomorphic, inferior 3-carpellate ovary with parietal placentation and capsular fruits.

In *Ornithochilus difformis* (Wall. ex Lindl.) Schltr., the stem is very short and the flower is yellow with thick reddish brown stripe. These characters are in agreement with Kurzweil (2014). *Eria acervata* Lindl. has 3- or 4-jointed pseudobulbs and 8 pollinia. Most of the inflorescences are erect and pendulous is found in *Ornithochilus difformis* (Wall. ex Lindl.) Schltr., *Pholidota articulata* Lindl. The flowers parts of *Geodorum citrinum* Jacks. are dropping. The flowers of *Pholidota* are small and white in colour. *P. articulata* Lindl., have two leaves. These characters agreed with those described by Wood *et al.*, (2009).

The number of pollinia in Orchidaceae were observed that found 2, 4 and 8. Among them, the 2 pollinia was found in 3 genera, 4 pollinia in 1 genera and 8 pollinia in 1 genera. *Paphiopedilum bellatulum* (Reichb. f.) Stein. and *Paphiopedilum parishii* (Reichb. f.) Stein. were usually not forming the coherent pollinia and only the anther masses were formed. These two species have 2 anther masses on each of staminodes. These characters are in accordance with the literature cited by Dassanayake (1981), Seidenfaden (1992) and Wu *et al.*, (2009).

Ng and Wee (1994) stated that *Paphiopedilum bellatulum* (Reichb. f.) Stein., and *P. parishii* (Reichb. f.) Stein., are described in International Union for Conservation of Nature (IUCN)

Red list as a Endangered species (EN). According to the present research, *P. bellatulum* (Reichb. f.) Stein. is sparsely found in the study area.

Today wild orchids are gradually disappearing due to human activity and some disappeared completely due to illegal trade to neighboring countries. Therefore, the valuable wild orchids from Pein Chit reserved forest area must protect by strong forest law for natural resources of Myanmar.

It can be concluded that some of the valuable orchids are still widely thriving in the study area and it is necessary to conserve the rare orchid species from extinctions.

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References

- Bartle, G., (1966), **The Orchids of Burma** (Including the Andaman Islands), Central press, Rangoon.
- Byng J. W., M. W. Chase, M. J. M. Christenhusz & M. F. Fay. 2016. **An update of the Angiosperm Phylogeny Group classification for the orders and families of flowering plants: APG IV.** Botanical Journal of the Linnean Society 181: 1-20.
- Chen X., Z. Liu, G. Zhu, K. Lang, Z. Ji, Y. Luo, X. Jin, P. J. Cribb, J. J. Wood, S. W. Gale, P. Ormerod, J. J. Vermeulen, H. P. Wood, D. Clayton and A. Bell, (2009), **Orchidaceae. In Flora of China.**
- Dassanayake, M. D. (1981), **A revised handbook to the flora of Ceylon.** Vol. 1 to 14. University of Peradeniya, Department of Agriculture, Peradeniya, Sri Lanka.
- Lawrence, G. H. M., (1964), **Taxonomy of Vascular Plants**, 9th printing. New York, USA.
- Ng, P. K. L & Y. C. Wee. 1994. **The Singapore red data book. A community service project by Asia Pacific Breweries.** The Nature Society, Singapore.
- Qi-ming, H. U. & W. U. De-lin. 2007-2009. **Flora of Hong Kong** Vol 1 to 3, Hong Kong Herbarium South China Botanical Garden, Chinese Academy of Sciences.
- Seidenfaden, G., (1992), **The Orchids of Indochina**, Opera Bot. 114: 1-502. Botanical Museum, University of Copenhagen, Gothersgade 130, DK-1123 Copenhagen K, Denmark.
- Singh, A. P. V. K. Rawat, S. K. Bahera & P. B. Khane. 2010. **Perspectives of Pteridophytes biodiversity: a source of economy elevation.** National Conference on Biodiversity, Development and Poverty Alleviation.
- Wood, H. P. 2006. The Dendrobiums. A. R. Gantner Verlag, K. G., Germany. Wu, Z. Y., P. H. Raven & D. Y. Hong. 1994-2011. **Flora of China.** Vol. 5, 10, 12, 16, 20-25. Science Press, Beijing and Missouri Botanical Garden Press, St., Louis.
- Wu, C. Y., P. H. Raven & D. Y. Hong. 2009. **Flora of China.** Vol. 25. Science Press, Beijing.