Study on phytochemical constituents and antimicrobial activities of some Myanmar medicinal orchids

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Abstract

Orchids belong to the family Orchidaceae. All the orchids were collected from different parts of the Tagu Village Tanintharyi District during flowering period 2018 to conduct this research work. In the present study, some medicinal orchids *Cymbidium aloifolia* (L) SW, *Dendrobium aphylum, Dendrobium cariniferum* Rchb.f., *Dendrobium chrysotoxum* (Lindl), *Dendrobium findaliyanum* Rchb.f., *Dendrobium morschatum* Buch-Ham., *Micropera thailandica* Sedenf & Smith, *Pholidotaim bricate* W.J.Hook., *Vanda coerulea* Griff.ex. lindl.and *Rhynchostylis retusa* (L.) Blumewere identified and examined the phytochemical constituents and antimicrobial activities of *Dendrobium morschatum, Micropera thailandica* and *Pholidota imbricata*. The vegetative and reproductive parts of the fresh specimens were identified by using available literature. The presence of alkaloids, carbohydrates, glycosides, α-amino acid, saponin, tannin, steroids, terpenoids, reducing sugar, starch and flavonoids were found in the phytochemical test. For antimicrobial activities, the different extracts of pseudobulbsof studied medicinal orchids were applied to some different microorganisms. The antimicrobial activities were done by using agar well diffusion method. Mostly active of methanol and ethyl acetate extracts were observed on studied microorganisms. The highest inhibition zones (40 mm-70 mm) were found in ethyl acetate extracts. Pseudobulbs of these plants can be used in managing the microbial infection. These results are basic for further pharmacological investigation on medicinal orchids.

Keywords: *Phytochemical Constituents and Antimicrobial activities*

Introduction

Many orchids have been used as a traditional system of medicines. Orchidaceae is one of the largest family among angiosperms with more than 30,000 species of 750 genera in the world. *Cymbidium aloifolium* (L) SW. is distributed in China, Japan, Thailand, Laos, Nepal, Sri Lanka and India. *Dendrobium* is native to the Myanmar, Thailand and Laos, Himalayas northern and eastern India, northern Bangladesh, Nepal, Bhutan, Assam, Yunnan and Indochina, Vietnam, Cambodia (Hossain, 2002). Distribution of*Microperathailandica* is Myanmar, Thailand and Vietnam. The specimen from Myanmar was found in primary evergreen forest at about 220 m. In Thailand recorded at elevations of between 700 and 1000 m. Common Name of *Micropera thailandica* isthe Thai Micropera(Seidenfaden, 1988)**.** *Pholidota imbricata* occurs on some Torres Strait Islands and in northeastern Queensland between Cape York also known from a single locality in the Northern Territory, Tropical continental Asia, Malaysia, Indonesia, Philippines, Papua New Guinea, Pacific island, and East to Tahiti. This plant is Epiphytic in lowland and montane forest, predominantly in the mountains (Vogel 1988). *Rhynchostylis retusa* (L) Blume distributed mainly in Taiwan, Southern China, Nepal, Thailand, Sri Lanka and India. *Vanda coerulea* (Griff. ex. Lindl). Are noticed in India, Burma and

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Thailand. Orchids are widely known for economic importance but less for their medicinal values. A wide range of chemical compounds is presented including alkaloids, bibenzyle derivatives, flavonoides, phenanthrenes and terpenoides which are present in leaves, roots, flowers or in the entire plant (Hossian, 2011 and Radhika, 2018).The leaves of *Cymbidium aloifolium* (L.) SW. are extensively used for stypic properties in the treatment of boil and fever by the local tribes (Nongdam and Chongtham, 2011). Local tribal people in the region use small seeds of plants for healing wounds (Medhi and Chakrabarti, 2009). In addition to this, the whole plant can also be used as tonic and treatment of vertigo, weakness of eyes, burn and sores (Chowdhery, 2001). The leaves of *Dendrobium* may be boiled and the resultant liquid extract is used as tonic and antipyretic. Erianthridin which is phenanthrenes extracted from the body of the plant shows anti-inflammatory activities (Yang *et al*., 2006). No users have been reported for *Micropera thailandica. Pholidota imbricate* bulbs are used bronchits, stomach and toothache. The leaves of *Vanda coerulea* Griff. ex. Lindl. can be used as an expectorant (Deorani and Sharma, 2007). The aim of this research is to evaluate the phytochemical constituents of Myanmar medicinal orchids. And then these results support for the further pharmacological investigation of medicinal orchids.

Materials and Methods

The pseudobulbs of some Myanmar medicinal orchids were collected from different parts of the Kyaing Tong Township, Eastern Shan State and Tagu village Tanintharyi District during the flowering period June 2018. The identification of species was made by Holturn (1964) and Backer (1963). The collected leaves and pseudobulbs of selected plants were repeatedly washed with tap water and finally with pure water. The sliced samples were dried under shades for three weeks. The leaves and pseudobulbs were dried at room temperature and made into powder using blender. Dried samples were stored in airtight containers for the phytochemical test and antimicrobial activities investigation. The sample powdered was used to antimicrobial activities investigation. The sample powdered was extracted with petroleum ether, methanol and ethyl acetate. Sox let apparatus was used for 6 hours. The extracts were filtered and filtrates were concentrated under reduced pressure at 40 C^0 using a Rota flash evaporator. The crude sample was subjected to antibacterial screening against some pathogenic organisms. These organisms were *Bacillus pumalis, Pseudomonas aeruginosa, Bacillus subtilis, Staphylococcus aureus, Candida albicans* and *Escherichia coli*. Ager-well diffusion method was used according to Cruickshank, 1970. These investigations were carried out in the Pharmaceutical Research Department of Ministry of Industry Yangon Division.

Results

Phytochemical test of pseudobulbsof some Myanmar medicinal orchids

Phytochemical test indicated that alkaloids, carbohydrates, glycoside, flavonoid and terpenoid, were present in the pseudobulbs of studied plants. The tests have shown that phenol and α-amino acid absence in *Cymbidium aloifolium*. Saponin absence *in Micropera thailandica* and *Pholidota imbricata*. Tannin absence in *Dendrobium aphylum, Dendrobium findayanum, Dendrobium morschatum, Micropera thailandica* and *Pholidota imbricata*. Steroid absence in *Dendrobium morschatum* and *Vanda coerulea.* Reducing sugar absence in *Dendrobium findayanum*. Starch absence in *Dendrobium findayanum, Micropera thailandica and Pholidota imbricata.* Cyanogenic glycoside did not found in these studied plants. These results were shown in Table 1.

Antimicrobial activities of pseudobulbsof three selected plants

Petroleum ether, methanol, ethyl acetate and ethanol and water extract of pseudobulbs and leaves showed an effective antimicrobial activity on six pathogens Petroleum ether extract of pseudobulbs did not show activity on studied microbes. Methanol extract of *Dendrobium morschatum* did not show activity on *Bacillus subtilis, Candida albican and Staphyllococcus aureus*. Ethyl acetate extract of pseudobulbs of selected plants showed the most effective on studied microbes. Among them, ethanol extract showed the highest activity on *Bacillus subtilis* and *Candida albican.* Petroleum ether extract of pseudobulbs of three selected plants did not show any activity. These results were shown in Table2 and Figure 2- 7.

Table1.Phytochemical constituent of some Myanmar medicinal orchids

No.	Type of compound	Results												
		1	2	3	4	5	6	7	8	9	10	11	12	13
1.	*Cymbidium aloifolium*	+	+	+	-	-	+	+	+	+	+	+	+	-
2.	*Dendrobium aphylum*	+	+	+	+	+	+	-	+	+	+	+	+	-
3.	*Dendrobium cariniferum*	+	+	+	+	+	+	+	+	+	+	+	+	-
4.	*Dendrobium chrysotoxum*	+	+	+	+	+	+	+	+	+	+	+	+	-
5.	*Dendrobium findaliyanum*	+	+	+	+	+	+	-	+	+	+	-	-	-
6.	*Dendrobium morschatum*	+	+	+	+	+	+	-	+	-	+	+	+	-
7.	*Micropera thailandica*	+	+	+	+	+	-	-	+	+	+	+	-	-
8.	*Pholidota imbricata*	+	+	+	+	+	-	-	+	+	+	+	-	-
9.	*Vanda coerulea*	+	+	+	+	+	+	+	+	-	+	+	+	-
10.	*Rhynchostylis retusa*	+	+	+	+	+	+	+	+	+	+	+	+	-

(+) = presence (-) = absence

Type of compounds 1. Alkaloid, 2. Carbohydrates, 3.Glycoside, 4. Phenol, 5.α-amino acid, 6.Saponin, 7.Tannin, 8.Flavonoid, 9.Steroid,10.Terpenoid, 11. Reducing sugar12. Starch, 13.Cyanogenicglycoside

Table2.Antimicrobial Activities of some Myanmar medicinal orchids

No.	StudiedPlants	Organisms																
		B. Pumalis			***B. subtilis***			***C. albican***			***E. coli***			***P. aeruginosa***			***S. aureus***		
		P	**M**	**EA**	**P**	**M**	**EA**	**P**	**M**	**EA**	**P**	**M**	**EA**	**P**	**M**	**EA**	**P**	**M**	**EA**
1	*D. morschatum*	-	20	40	-	-	45	-	-	45	-	20	45	-	20	50	-	-	40
2	*M. thailandica*	-	18	40	-	20	40	-	18	40	-	20	40	-	20	50	-	18	40
3	*P. imbricate*	-	25	65	-	25	70	-	25	70	-	25	65	-	-	65	-	25	63

Agar well – <10 mm (inactive) ,10 mm ~ 14 mm (partially active), 15 mm ~ 19 mm (active)

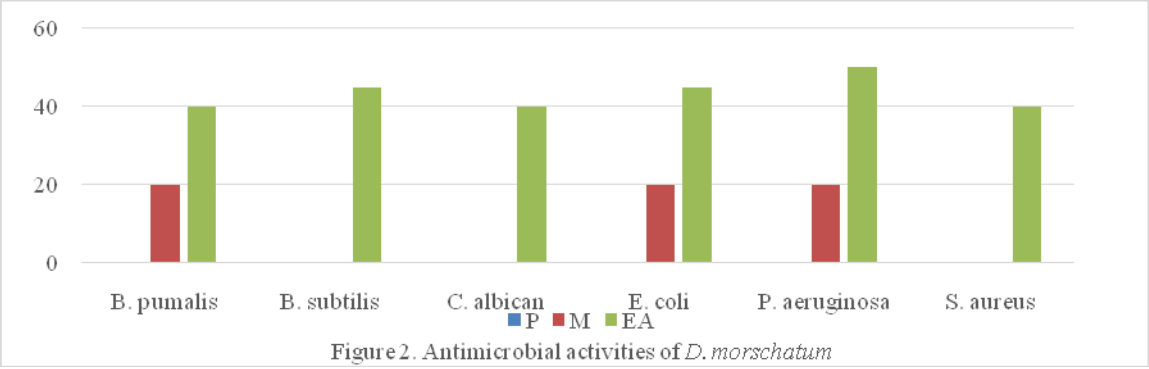


Figure 2. Antimicrobial activities of *D. morschatum*

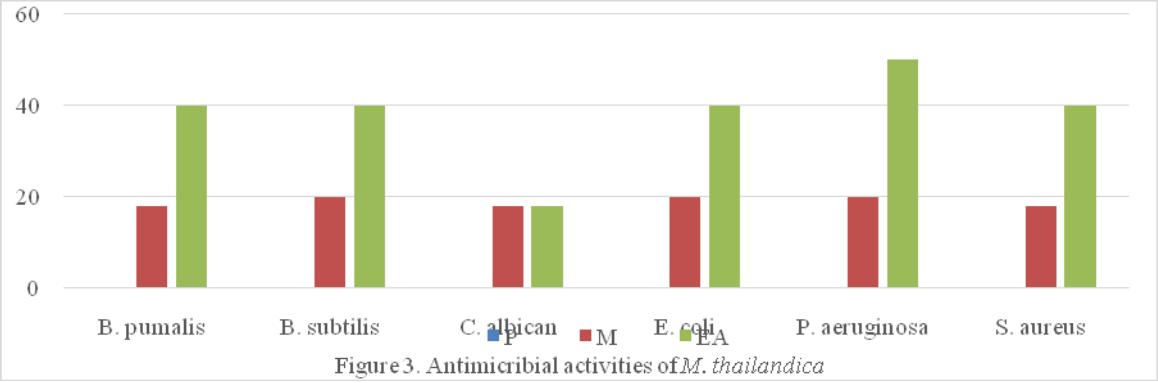


Figure 3. Antimicrobial activities of *M. thailandica*

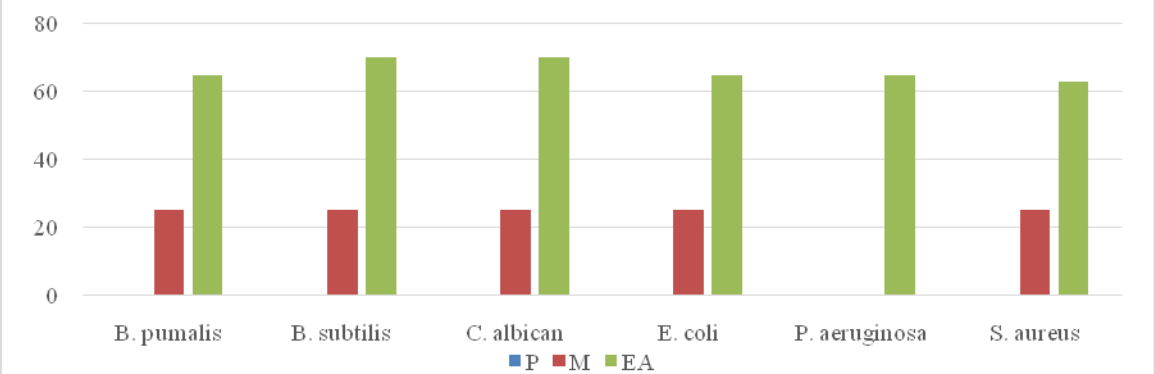
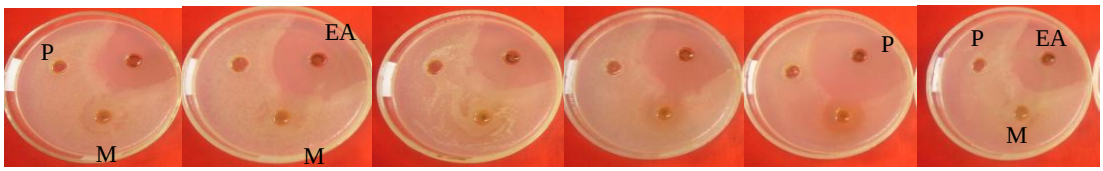
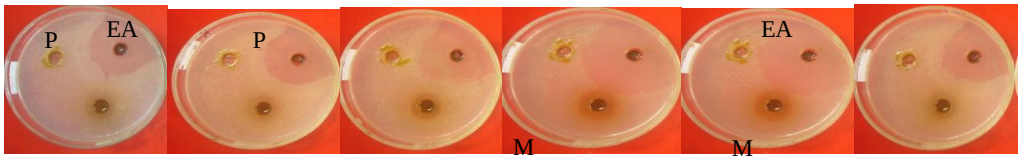
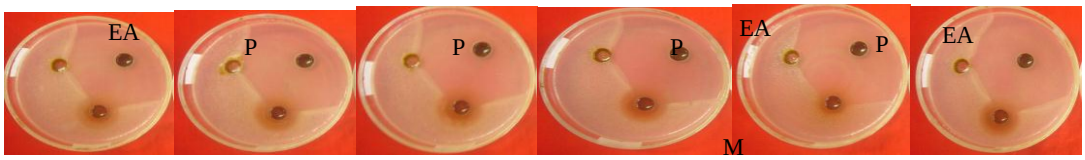


Figure 4. Antimicrobial activities of *P. imbricata*



E. coli





C. albicans

Figure 7. Antimicrobial activities of *P. imbricata*

Discussion and Conclusion

In this study, phytochemical parameters and antimicrobial activities were evaluated for pseudobulbs of *Cymbidium aloifolium, Dendrobium aphylum, Dendrobium cariniferum, Dendrobium chrysotoxum, Dendrobium findaliyanum, Dendrobium morschatum, Micropera thailandica, Pholidota imbricate, Vanda coerulea and Rhynchostylis retusa*. *Cymbidium aloifolium, Dendrobium aphylum, Dendrobium cariniferum, Dendrobium chrysotoxum, Dendrobium findaliyanum, Dendrobium morschatum* were alkaloids, carbohydrates, glycosides, flavonoids and terpenoids present. These results agreed with the finding of William (1979). The phytochemical analysis of *Dendrobium morschatum* pseudobulbs shows the presence of alkaloids, carbohydrates, glycosides, saponins, terpenoids, steroids, flavonoids, phenolic compounds, tannins. This result is similar to the results of Sarmad *et al.*, 2012 and Mazumder *et al.*, 2010. Radhika, 2018 reported that orchids contain alkaloids, tannins, flavonoids, flavones, flavonones, glycosides, phenol, saponins. *Micropera thailandica* showed presence of alkaloid, carbohydrates, glycoside, phenolic compound, α-amino acid, saponin, flavonoids, terpenoids reducing sugar and starch. *Pholidotaim bricata* showed presence of alkaloid, carbohydrates, glycoside, phenolic compound, α-amino acid, saponin, flavonoids, terpenoids reducing sugar and starch. These results were an agreement with those mentioned by Chulin, 2006. Alkaloids, flavonoids, steroids, terpenoids, reducing sugar and glycosides were present. This result agreed with Bhattacharjee and Islam, 2015. Flavonoids, alkaloids and carbohydrates were present. The present results agreed with Singh and Duggal, 2009 and Doughari *et al.*, 2007, Williams, 1979. Phenolic compounds, saponin and amino acid were absent. The present agreed with Shubha and Chowdappa, 2016. In the antimicrobial activity, methanol and ethyl acetate extracts of leaves and pseudobulbs showed mostly active against on studied microbes. Ramesh and Susan, 2012 reported that ethyl acetate extract of *Pholidotaim bricata* active against on *Candida albican, Bacillus subtilis,* and *E. coli* and *Staphyllococcus aureus.* Then ethyl acetate extract of *Dendrobium morschatum* and *Micropera thailandica* were highest against on studied microbes. These results were found in this research. In conclusion, Myanmar medicinal orchids contain many kinds of secondary

metabolites. In this research paper showed that the different extracts of selected medicinal orchids have good antimicrobial properties. It has also been observed and accepted that the medicinal value of a plant lies in the bioactive phytochemical components present in these orchids. These results will form a good basic for further pharmacological investigation on medicinal orchids.

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