

## MORPHOLOGICAL CHARACTERS OF *BARLERIA CRISTATA* L. AND *BARLERIA PRIONITIS* L. AND THEIR ANTIMICROBIAL ACTIVITIES

Sanda Myint<sup>1</sup>, Zin Moe Moe<sup>2</sup>, Myint Myint Khaing<sup>3</sup>

### Abstract

The medicinal plants *Barleria cristata* L. and *Barleria prionitis* L. belong to the family Acanthaceae. *Barleria cristata* L. is known as blue bell *barleria* in English, leik-tha-ywe-pya in Myanmar. *Barleria prionitis* L. is known as porcupine flower in English, leik-sa-ywe in Myanmar. These plants are collected from Pyay Township. Comparative morphological characters, *Barleria cristata* L. is perennial bush branched shrubs; leaves simple, glabrous in two surfaces. *Barleria prionitis* L. is perennial erect spinescent herbs or undershrubs; leaves simple, exstipulate, spines 2-4 in the leaf axils, sparsely pubescent on both surfaces. In the result of antimicrobial test, various extracts of the leaves of *Barleria cristata* L. and *Barleria prionitis* L. are tested against six pathogenic microorganisms by using paper disc diffusion assay method. Antimicrobial activities of different solvent extracts (petroleum-ether, chloroform, ethyl-acetate, acetone, ethanol, methanol and water) of *Barleria cristata* L. and *Barleria prionitis* L. were tested on six pathogenic microorganisms such as *Aspergillus flavous*, *Bacillus subtilis*, *Candida albicans*, *Escherichia coli*, *Pseudomonas fluorescens* and *Xanthomonas oryzae* at Department of Botany, University of Yangon.

**Keywords:** morphological characters, various leaves extracts, different microorganisms.

### Introduction

Family Acanthaceae consists of about 250 genera and 2500 species widespread in tropical regions. *Barleria* is a large genus, pantropical genus of herbs and shrubs comprising of more than 300 species world-wide. *Barleria* is the most widespread, occurring almost throughout the entire geographic range of the genus. It distinguished by its conspicuously scarious calyx and axillary inflorescence based on scorpioid cymes, flowers weakly zygomorphic and 2-seeded (Hakimi *et al.*, 2018).

*Barleria cristata* L. is an erect or diffuse herb, up to 1 m tall, stem appressed hairy, densely hairy at the nodes; branches and bracteoles spiny, leaves elliptic-oblong to lanceolate, acute or acuminate, hairy on both sides, flowers bluish-purple, pink or white, pubescent outside, born in 1-4 flowered axillary and terminal spikes, fruits capsules, ellipsoid or oblong, acute at both ends, 4-seeded and seeds orbicular, compressed, silky-hairy. *Barleria cristata* L. has various medicinal and therapeutic uses. *Barleria cristata* is an ornamental perennial shrub. Different parts of *Barleria cristata* L. have been used in the treatment of various diseases like anemia, toothache and cough, antimicrobial, anti-inflammatory and hepatoprotective activity. Root and leaves are used in the treatment of swelling and inflammation (Bency *et al.*, 2018). *Barleria prionitis* L. is bush-branched, perennial, usually prickly shrub, stem rounded branches, leaves opposite, elliptic, acuminate, lineolate, bristletipped, entire, glabrous above, young leaves often pubescent beneath, flowers orange-yellow or cream-coloured, sessile, borne in axillary foliaceous bristletipped bracts, fruits capsules ovoid with a tapering beak, 2-seeded and seeds compressed, ovate, clothed with silky appressed hairs (Naidu, 2012). The whole plant and especially the roots are used as tonic and diuretic (Hakimi *et al.*, 2018). Leaves, stem and root of *Barleria prionitis* possess antibacterial and anti-inflammatory activities (Aneja *et al.*, 2010). *Barleria prionitis* L.

<sup>1</sup> Dr, Associate Professor, Depart of Botany, Pyay University

<sup>2</sup> Dr, Associate Professor, Depart of Botany, Pyay University

<sup>3</sup> Lecturer, Depart of Botany, Pyay University

Leaves and young inflorescences are diuretic. Leaf juice used in stomach disorders, urinary affections, fever and catarrh; leaf juice applied to lacerated soles of feet in rainy season and also for pimples. Leaf extract is effective in reducing blood sugar in diabetic animals (Bhogaonkar and Lande, 2012). Another shrub from the same family *Barleria prionitis*, has been much widely researched with documented medicinal properties of the whole plant, leaves, and roots against e.g., diabetes and respiratory diseases (Pathy *et al.*, 2015). The aim and objectives of this research paper were to identify the comparative morphological characters and to examine the antimicrobial activities leaves extract of *Barleria cristata* L. and *Barleria prionitis* L.

### Materials and Methods

The specimens of *Barleria cristata* L. and *Barleria prionitis* L. used in this research were collected from Pyay Township Area, Bago Region. *Barleria cristata* L. flowering period is November to February. *Barleria prionitis* L. flowering period is November to March. After collecting, the plants were mounted between newspaper sheets, were dried, they were mounted into herbarium sheets. The plant identification was carried out in the Department of Botany, Pyay University to get correct family, genus and species with the help of references literature such as Hooker (1885), Kirtikar and Basu (1975), Burkill (1935), Lawrence (1964), Dassaneyake (1995), Balkwill and Balkwill (1997) and Kress (2003).

Antimicrobial activities of different solvent extracts (petroleum-ether, chloroform, ethyl-acetate, acetone, ethanol, methanol and water) of *Barleria cristata* L. and *Barleria prionitis* L. were tested on six pathogenic microorganisms such as *Aspergillus flavous*, *Bacillus subtilis*, *Candida albicans*, *Escherichia coli*, *Pseudomonas fluorescens* and *Xanthomonas oryzae* at Department of Botany, University of Yangon.

Screening of antimicrobial activity of crude extracts had been done by paper disc diffusion method Cruickshank (1975). Paper disc having six millimeter diameter were utilized for antimicrobial test. Among medium was prepared according to the method described by Atlas (1993). Among medium was boiled and 20-25 ml of the medium was poured into each conical flask, plugged with cotton wool and autoclaved at 121°C for 15 minutes. Then the conical flask was cooled down to 40-45°C and each of 0.1-0.2 ml of test organisms were also added into the flask and then, poured into sterilized petridishes. After solidification, paper disc impregnated with sample were applied on the agar plates and incubated at 37°C for 24 hours. Then the diameter of inhibitory zone was measured with the help of a transparent ruler.

### Results

Scientific Name	: <i>Barleria cristata</i> L. Sp. Pl. 1753.
Synnonum	: <i>Barleria ciliate</i> Roxb.
English Name	: Blue bell barleria
Myanmar Name	: Leik-tha-ywe-pya
Family	: Acanthaceae
Flowering and Fruiting period	: November to February
Morphological characters of <i>Barleria cristata</i> L.	

Perennial much branched shrub, stem terete, glabrous. Leaves opposite and decussate, simple, petiolate, exstipulate; laminar elliptic-oblong (5.0-9.5 x 1.5-4.5 cm), the tip cuspidate, the

margin entire, the base attenuate, deep green in two surfaces, glabrous; petiole 0.5-1.0 cm long, canaliculated above and rounded beneath, glabrous. Inflorescence axillary short and dense cymes, many flowered. Flower 1.5 cm across at anthesis, bracts absent, bracteolate, pedicellate, bisexual, zygomorphic, 4 merous, hypogynous. Calyx 4 sepals, foliaceous, fused, slightly connate at the base, the outer calyx lobed oblong-lanceolate, margin spiny, inner calyx lobed linear lanceolate, margin scarious, persistent. Corolla 5 lobed, fused, infundibuliform, bilabiate, the tube 1.8-2.0 cm long, violet or puplish-blue. Stamens 4+1<sup>st</sup>, free, epipetalous, didynamous, the filament 0.5-2.0 cm long, the anther ditheous, oblongoid, longitudinal dehiscent. Ovary superior, oblong, 2 carpels, fused, 2 locules, two ovules in each locule, axile placentation, the style long and slender, the stigma bifid. Fruit loculicidal capsule, ovoid. Four seeded.

Scientific Name	:	<i>Barleria prionitis</i> L., Sp. Pl. 2:636. 1753.
Synnonum	:	<i>Barleria spicata</i>
English Name	:	Porcupine flower
Myanmar Name	:	Leik-sa-ywe; Leik-tha-ywe
Family	:	Acanthaceae
Flowering and Fruiting period	:	November - March

#### Morphological characters of *Barleria prionitis* L.

Perennial erect spinescent herbs or undershrubs, up to 40-60 cm hight, mush branched, branches subterete, pubescent; spines 2 – 4 in the leaf axils, 1.2 – 2.0 cm long, white. Leaves opposite and decussate, simple, petiolate, exstipulate; lamina elliptic oblong, cuspidate at the tip, entire at the margin, acuminate at the base, sparsely pubescent on both surfaces. Inflorescence axillary cyme, 1 – 3 flowered per flower axil, spike, spinescent. Flower bright yellow, about 2 cm in across at anthesis, bracts foliaceous, oblong-lanceolate, spinescent, persistent, sessile, zygomorphic, bisexual, 4 merous, hypogynous. Sepals 4, in opposite pair, the outer pair much larger, 1.0 x 0.3 cm, broadly lanceolate, the inner pair small, 0.8 x 0.1 cm, linear lanceolate, spinescent at the tip, pubescent, persistent. Corolla 5 lobed, infundibuliform, yellow, tube about 1 cm long, slightly curved, widened upwards, lobes broadly ovate, about 1.0 x 0.8 cm, unequal, glabrous. Stamens 4, didynamous, 2 fertile, 2 staminodes, petalostemonous, the filaments of the fertile stamens longer and exserted, the filament filiform, the other stamens minute and inserted, pilose, the anthers ditheous, dorsifixed, introrse, longitudinal dehiscent. Ovary ovoid, carpels 2, syncarpous, 2-loculed, 2 ovules in each locule, axile placentation, the style long and slender, the stigma bifid, ovary superior. Fruit a loculicidal capsule, 2-seeded, accrescent calyx. Seed ovoid, compressed.

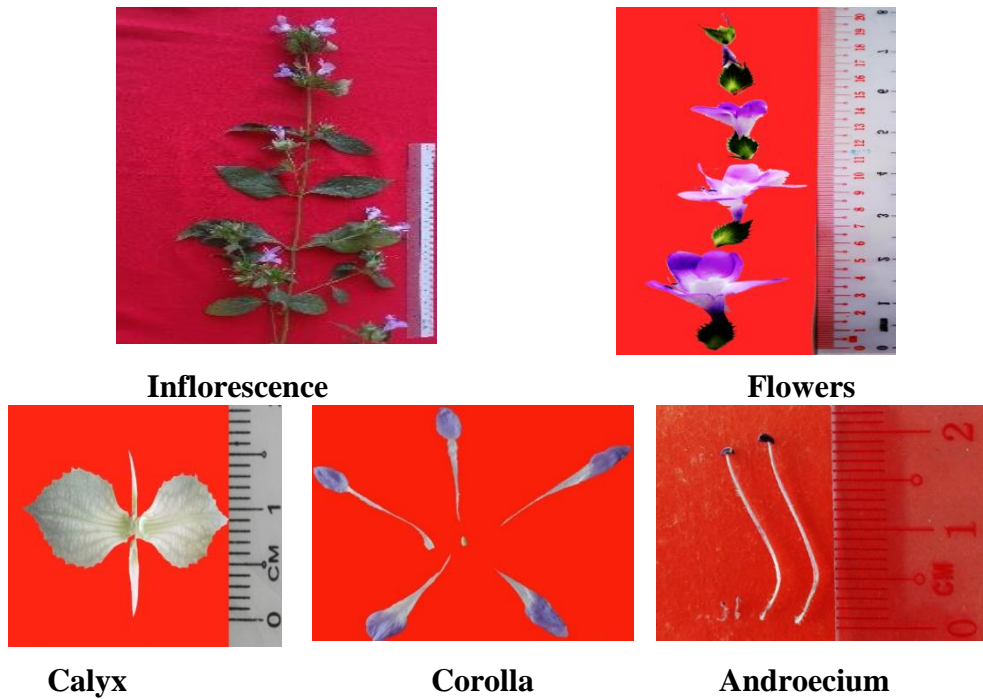
#### Morphological characters of *Barleria cristata* L.



**Habit**

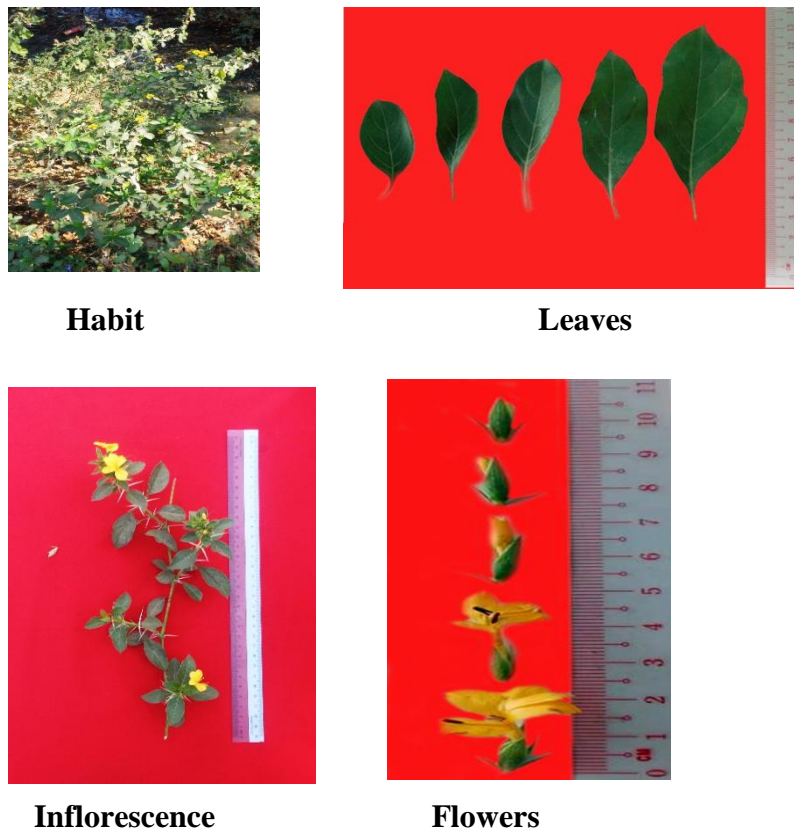


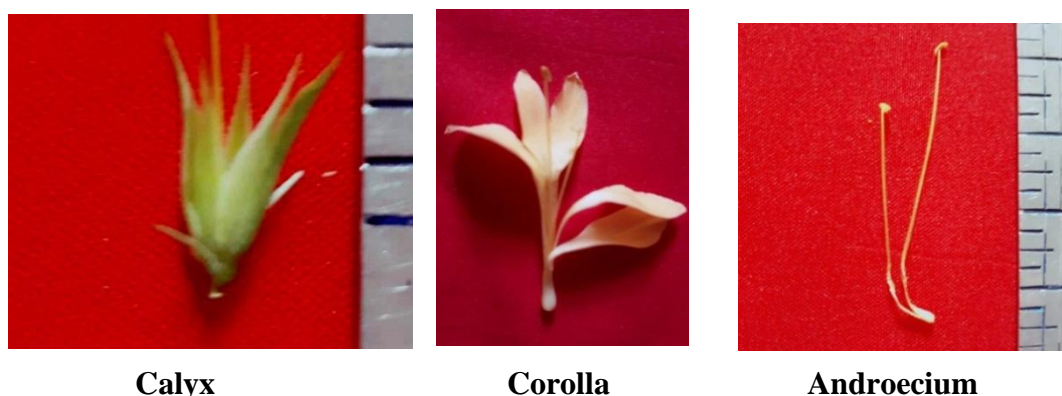
**Leaves**



**Figure 1** Morphological characters of *Barleria cristata* L.

**Morphological characters of *Barleria prionitis* L.**





**Figure 2** Morphological characters of *Barleria prionitis* L.

**Table 1** Comparison the characteristics of *Barleria cristata* L. and *Barleria prionitis* L.

Scientific name	<i>Barleria cristata</i> L.	<i>Barleria prionitis</i> L.
Myanmar Name	Leik-tha-ywe-pya	Leik-sa-ywe; Leik-tha-ywe
English Name	Blue bell barleria	Porcupine flower
Habit	Perennial mush branched shrubs	Perennial erect spinescent herbs or undershrubs
Leaves	opposite and decussate, simple, exstipulate, glabrous in two surfaces	opposite and decussate, simple, exstipulate, spines 2 – 4 in the leaf axils, sparsely pubescent on both surfaces
Inflorescence	Axillary cymes, many flowered per axil.	Axillary cymes, 1-3 flowered per axil, spinescent
Flowers	Ebracteate, bracteolate, persistent, purplish blue or violet	Bracteate, bracteolate, persistent, bright yellow
Calyx	Sepals 4, the outer pair much larger, foliaceous, reticulate, spinescent at the margin; the inner pair small, pubescent.	Sepals 4, the outer pair much larger, foliaceous, spinescent at the tip, pilose; the inner pair small, pubescent
Corolla	Petals 5, fused, bilabiate, purplish-blue	Petals 5, fused, bilabiate, bright yellow
Androecium	Stamens 4+1 <sup>st</sup> , didynamous, 4 fertile, one staminode	Stamens 4, didynamous, 2 fertile, 2 staminodes, pilose at the base
Gynoecium	Ovary superior, oblong, 2 carpels, fused, two ovules in each locule, axile placentation	Ovary superior, ovoid, 2 carpels, fused, two ovules in each locule, axile placentation

**Table 2 Antimicrobial activities of diffusion solvent Leaves extracts of *Barleria cristata* L. and *Barleria prionitis* L.**

Extracts	Test Organisms											
	<i>Aspergillus flavous</i>		<i>Bacillus subtilis</i>		<i>Candida albicans</i>		<i>Escherichia coli</i>		<i>Pseudomonas fluorescens</i>		<i>Xanthomonas oryzae</i>	
	<i>Barleria cristata</i>	<i>Barleria prionitis</i>	<i>Barleria cristata</i>	<i>Barleria prionitis</i>	<i>Barleria cristata</i>	<i>Barleria prionitis</i>	<i>Barleria cristata</i>	<i>Barleria prionitis</i>	<i>Barleria cristata</i>	<i>Barleria prionitis</i>	<i>Barleria cristata</i>	<i>Barleria prionitis</i>
Pet-ether	12	12	-	12	-	-	14	-	-	14	12	12
CHCl <sub>3</sub>	12	16	16	14	14	-	18	12	16	14	12	12
Me OH	-	-	-	-	-	-	-	-	-	-	-	-
Acetone	-	-	-	-	-	-	-	-	-	-	-	-
EtoAc	-	-	-	-	-	-	-	-	-	-	-	-
EtOH	-	-	-	-	-	-	-	-	-	-	-	-
H <sub>2</sub> O	-	-	16	12	-	-	-	12	-	-	-	-

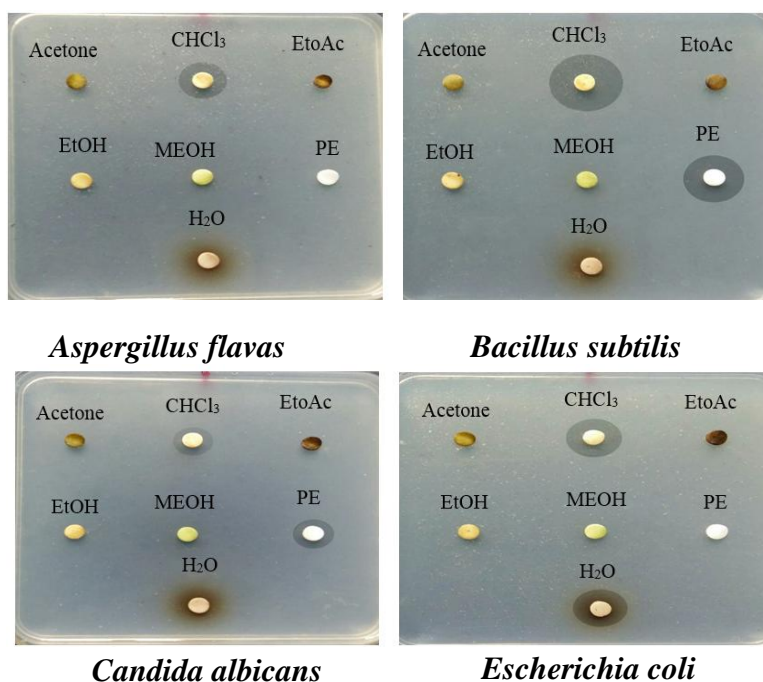
Paper disc size – 6 mm

10 mm - below (poor activity)

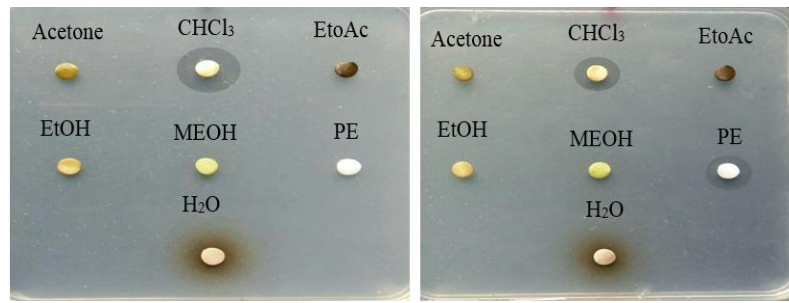
10 mm -14 mm (weakly activity)

14 mm - above (highly activity)

**Antimicrobial activities of diffusion solvent extract of the leaves of *Barleria cristata* L.**





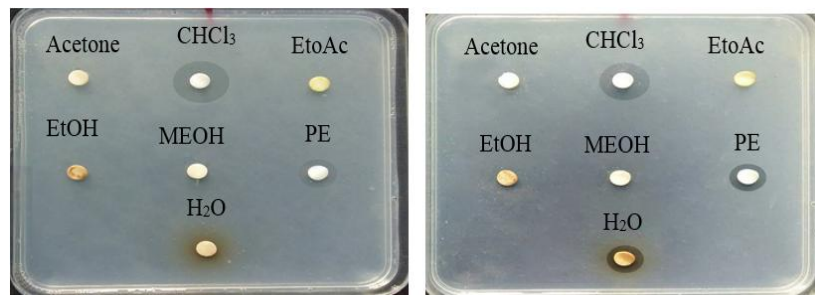


*Pseudomonas fluorescens*

*Xanthomonas oryzae*

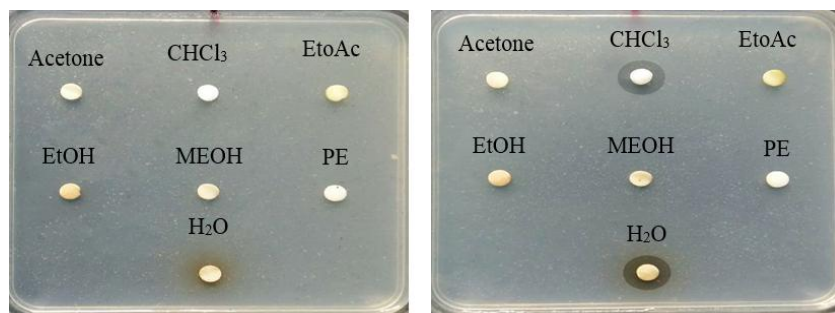
**Figure 3** Antimicrobial activities of diffusion solvent extract of the leaves of *Barleria cristata* L.

**Antimicrobial activities of diffusion solvent extract of the leaves of *Barleria prionitis* L.**



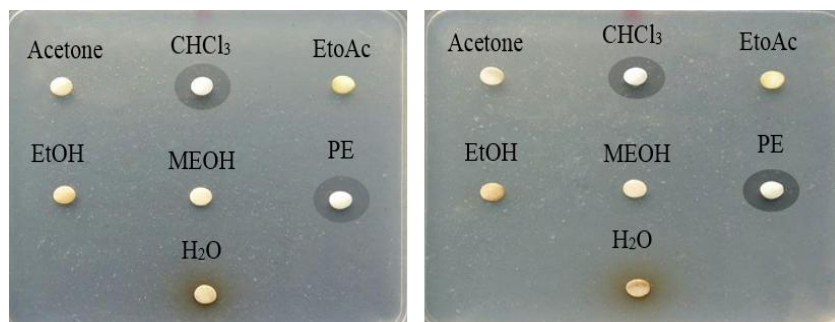
*Aspergillus flavus*

*Bacillus subtilis*



*Candida albicans*

*Escherichia coli*



*Pseudomonas fluorescens*

*Xanthomonas oryzae*

**Figure 4** Antimicrobial activities of diffusion solvent extract of the leaves of *Barleria prionitis* L.

## Discussion and Conclusion

The medicinal plants *Barleria cristata* L. and *Barleria prionitis* L. belong to the family Acanthaceae were collected from Pyay Township, Bago Region. In the present investigation, comparative morphological characters and antimicrobial activities of *Barleria cristata* L. and *Barleria prionitis* L. are carried out. In morphological characters of *Barleria cristata* L. is perennial much branched shrub, stem terete, glabrous. Leaves simple, petiolate, exstipulate; lamina elliptic-oblong, the tip cuspidate, the base attenuate, glabrous; petiole long, canalculated above and rounded beneath, glabrous. Inflorescence axillary short and dense cymes. Flower violet or purplish-blue, bract absent, bracteolate, bisexual, zygomorphic, 4 merous, hypogynous. Calyx 4 sepals, foliaceous, fused, persistent. Corolla 5 lobed, fused, infundibuliform, bilabiate, violet or purplish-blue. Stamens 4+1<sup>st</sup>, free, petalostemonous, didynous, the filament long, the anther dithecal, dorsifixed, oblongoid. Ovary superior, oblong, 2 carpels, 2 locules, axile placentation, the style long and slender, the stigma bifid. Fruit loculicidal capsule, ovoid. Four seeded.

*Barleria prionitis* L. is perennial erect spinescent herbs or undershrubs, branches subterete, pubescent; spines 2-4 in the leaf axils. Leaves simple, petiolate, exstipulate; lamina elliptic-oblong. Inflorescence axillary cyme, spike, spinescent. Flower bright yellow, bracts foliaceous, spinescent, zygomorphic, bisexual, 4 merous, hypogynous. Sepals 4, spinescent at the tip, pubescent, persistent. Corolla 5 lobed, infundibuliform, yellow. Stamens 4, didynamous, 2 fertile, 2 staminodes, petalostemonous, the filament filiform, pilose, the anther dithecal, dorsifixed, introrse, longitudinal dehiscent. Ovary ovoid, carpels 2, syncarpous, 2 locules, 2 ovules in each locule, axile placentation, style long and slender, stigma bifid, ovary superior. Fruit a loculicidal capsule, 2 seeded, accrescent calyx. Seed ovoid, compressed.

These characters are in agreement with those of describe by Hooker (1885); Kirtikar&Basu (1975); Burkill (1935); Lawrence (1964); Dassaneyake (1995); Balkwill M.J & Balk will, K., (1997); and Kress (2003).

In this research, antimicrobial activities of leaves extracts of *Barleria cristata* L. and *Barleria prionitis* L. are tested on six pathogenic microorganisms by using paper disc diffusion method. The result of the present study with pet-ether, chloroform, methanol, acetone, ethyl acetate, ethanol and aqueous extracts of *Barleria cristata* L. and *Barleria prionitis* L. showed the significant activities against six microorganisms.

Pet- ether, chloroform and aqueous extract of the leaves of *Barleria cristata* L. and *Barleria prionitis* L. more effective than different extracts of antimicrobial activity against six microorganisms. Methanol, acetone, ethyl acetate and ethanol extracts of leaves did not show antimicrobial activity against six microorganisms. Among them pet-ether and chloroform leaves extracts of *Barleria cristata* L. showed sensitive against *Aspergillus flavous*, *Xanthomonas oryzae* and more sensitive against *Bacillus subtilis*, *Candida albicans*, *Escherichia coli* and *Pseudomonas aeruginosa*. Aqueous extracts showed more sensitive against *Bacillus subtilis*. Chloroform, pet-ether and aqueous extracts showed *Aspergillus flavous*, *Bacillus subtilis* and *Escherichia coli* and more sensitive against *Aspergillus flavous*, *Bacillus subtilis* and *Pseudomonas fluorescences*.

Therefore, the present research focuses the usefulness medicinal plant *Barleria cristata* L. and *Barleria prionitis* L. on antimicrobial activity.



So, the medicinal plant of *Barleria cristata* L. and *Barleria prionitis* L. can be utilized for Myanmar traditional medicine systematically.

### Acknowledgements

I would like to express to my gratitude to Professor Dr. Mie Mie Myint Shein, Head of Department of Botany, Pyay University, for providing all departmental facilities and valuable suggestions. Personally, my special thanks are due to Professor Dr. Nyo Nyo Thaug, Department of Botany, Pyay University for her valuable leading toward the successful completion of this research.

### References

- Aneja K. R., R. Joshi and C. Sharma. (2010). **Potency of *Barleria prionitis* L. bark extracts against oral diseases causing strains of bacteria and fungi of clinical origin.** New York Science Journal; 3(11), India.
- Backer, C.A. and R.C. Bakhuizen Van Der Brink, Jr. (1965). **Flora of Java**, Vol II.Noordhoff-Groningen. The Netherland.
- Balkwill, M.J. and Balkwill, K. (1997). **Delimitation and infrageneric classification of *Barleria* (Acanthaceae).** Kew Bull. 52 (3): 535-573.
- Bency A., J. Lohidas and M. Murugan. (2018). **Preliminary Phytochemical Investigation and Antibacterial Activity of *Barleria Cristata* Linn.** International Journal of Scientific Research and Reviews. 7(3), 1063-1069. ISSN: 2279-0543.
- Bhogaonkar P.Y. and S.K. Lande. (2012). **Anatomical Characterization of *Barleria prionitis* Linn. : A Well-known Medicinal herb.** Biological Forum — An International Journal, 4(1): 1-5. ISSN: 0975-1130.
- Cruikshank, R.J.P. (1975). **Medicinal Microbiology.** Living Stone Ltd., London.
- Dassanayake.(1995). **A Revised Handbook to Flora of Ceylon.** Vol IX
- Hakimi, A. S. A., Q.Z. Faridah, A.S. Abdulwahab and A. Latiff. (2018). Pollen and seed morphology of *Barleria* L. (Barlerieae: Ruellioideae: Acanthaceae) of Yemen. *South African Journal of Botany* 116, 185–191.
- Hooker, J.D.(1885). Vol-IV, **The Flora of British India**, L. Reece Co.Ltd.The Cost House, Brook, Ashford, Kent. England.
- Hundley, H.G. and Chit Ko Ko. (1987). **List of Trees, Shrubs, Herbs and Principle Climbers etc.** Govt. Printing and Stationary.
- Kartikar and K.R., Basu. (1975). **Indian Medicinal Plants.** Vol I, p.p 813-815, International Distribution, Indian.
- Kress, J.W. and Yin Yin Kyi, Daw. (2003). **A Check List of Trees, Shrubs, Herbs and Climbers of Myanmar.** Department of Systematic Biology Botany, National Museum of Natural History Washington, DC.
- Lawrence, G.H.M. (1964). **Taxonomy of Vascular Plant.** The Macmillian Company, New York.
- Naidu, V.S.G.R. (2012), **Hand Book on Weed Identification.** Directorate of Weed Science Research, Jabalpur, India Pp 354.
- Pathy M., T. Sharma and S. Bhatnagar. (2015). ***Barleria Cristata*: A Comparative Analysis of Phytochemical, Cytotoxic and Antioxidant Activities of and Bark Extracts.** European Journal of Pharmaceutical and Medicinal Research, 2[5], 586-593. ISSN: 3294-3211.
- Shankar, M.S. and S.R. Yadav. (2010). **Revision of the Genus *Barleria* (Acanthaceae) in India.** Vol. 20(2), Department of Botany, Shivaji University, Kolhapur-416004, Maharashtra, India.
- Sharma P., G.N. Sharma, B. Shrivastava and H. R. Jadhav, .(2014). Evaluation of Antioxidant Potential of *Barleria prionitis* Leaf and Stem. *American Journal of Phytomedicine and Clinical Therapeutics: JPCT* [2] [11]1177-1186. ISSN: 2321 – 2748.
- Sumaya B., E. Honey, B. Anasuya I. H. Gangarayudu, M. J. Reddy and C. Girish. (2017). **Investigation of Antibacterial Activity of Different Extracts of *Barleria cristata* Leaves.** International Journal of Health Sciences & Research, Vol.7; Issue: 9; ISSN: 2249-9571.