Ethnobotanical Study on Some Myanmar Snacks Found in Banmaw City, Kachin State

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Abstract

An Ethnobotanical study of some snacks was conducted in Banmaw City, Kachin State through semi-structured questionnaires, interview and field survey. The study aimed at recording traditional knowledge on the use of plants to make snacks and provide information towards the conservation of indigenous snacks made with plants. 36 plants species belonging to 18 plant families were reported to make about 52 snacks in Banmaw City. 52 snacks were recorded and use value (UV) of 36 species was also calculated. The survey of the local people indicates that snacks play an important food in their families. *Oryza sativa*L. (Saba), *Borassus flabellifer* L. (Htan), *Arachis hypogaea* L. (Mye pe), *Oryza sativa* L. var. *fatua* Prain. (Kauk hnyin), *Coscos nucifera* L. (Ohn) were found that they were the most useful plant species in Myanmar snacks. The highest use value was observed in *Oryza sativa* L. showed the first rank and use value (UV = 23.79). *Mangifera indica* L. showed the least use value (UV = 0.84).

Key words: Ethnobotany, Use Value (UV), snacks

Introduction

Ethnobotany is an interdisciplinary science, which includes aspects of both science and humanities. The term "ethnobotany" was first coined in 1895 by the American botanist John Harshberger as "the study of plants used by primitive and aboriginal people". The term quickly began to be used and a new field was opened. Until the turn of the 20thcentury, ethnobotany was primarily the study of native uses of plants. Since Harshberger, the definition of ethnobotany has changed and evolved along with the formation and evolution of field.

Modern definition of ethnobotany has been defined as "the scientific discipline concerned with the interactions between people and plants". There are many aspects of Ethnobotany, including the ways that people name and classified plants, the values placed on them, their uses and their management. It reaches across the natural and social sciences.

Plants are always influent on human culture because people used plants species for their requirements such as food, medicine, clothes and shelter, fiber, many plant products and for the fulfillment of cultural needs since people appearance on the earth.

Many people use various plants for their eating culture. Recent work of investigation deals with some Myanmar snacks resources found in Banmaw city. Therefore, the present study emphasizes on the role of some snacks eaten by Myanmar society within the subdiscipline of Ethnobotany "Plant as basis for human material culture".

Materials and Methods

The study was conducted from Banmaw City, Kachin State. Identification of collected specimens was carried out by referring to Hooker (1881-87), Brandis (1906), Backer (1965) and Dysenayake (1980-2001). Firstly, the synoptical key to the family written by Hutchinson

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(1954) is used to know the families. Finally the scientific names were identified. Myanmar names were recorded by Handly & Chit Ko Ko (1987) and Kress *et al.* (2003).All the collected species were systematically arranged according to the classification scheme of APG IV. To compare the usage of 36 species and the use value (UV) was calculated by Phillips (1996).

Calculation of use value by Phillips (1996).

$$UV = \frac{\Sigma ui}{n}$$

UV = use value of a species

ui = the number of uses mentioned by each informant for a given species

n = the total number of informants

Results

The results of this research showed that 36 plants belonging to 18 plant families were determined to be used traditionally in Banmaw City for using some snacks and the result showed in Table 1 and 2.

Table 1. Arrangement of the species under study

Class- Magnoliopsida

Sub-class	Order	Family	Scientific name	Myanmar name
Magnoliidae	Liliales	Liliaceae	*Allium cepa* L.	Kyet thun ni
			Allium sativum L.	Kyet thun byu
	Arecales	Arecaceae	*Borassus falbellifer* L.	Htan
			Coscos nucifera L.	Ohn
			Metroxylon sagu Rotb.	Tha gu
	Zingiberales	Musaceae	*Musa sapientum* L.	Hnet pyaw
		Zingiberaceae	*Curcuma longa* Koerig.	Na nwin
			Zingiber officinale Rosc.	Gyin
	Poales	Poaceae	*Cephalostachyum pergracile* Munro	Paung thin wa
			Cymbopogon citratus Stapf.	Sabalin
			Oryza sativa L.	Saba
			Oryza sativa L. var. *fatua* Prain.	Kauk hnyin
			Saccharum officinarum L.	Kyan
			Triticum aestivum L.	Gyone
			Zea mays L.	Pyaung
		Papaveraceae	*Papaver somniferum* L.	Bein
	Vitales	Vitaceae	*Vitis vinifera* L.	Sa pyit
	Fabales	Fabaceae	*Arachis hypogaea* L.	Mye pe
			Cicer arietinum L.	Kalape
			Phaseolus mungo L.	Mat pe
			Phaseolus radiates L.	Pe di sein
			Pisum sativum L.	Sadawpe

Table 1. continued

Sub-class	**Order**	**Family**	**Scientific name**	**Myanmar name**
			Vigna catjang Walp.	Pe lun
			Tamarindus indica L.	Ma gyi
Magnoliidae	Rosales	Rhamnaceae	*Zizyphus jujuba* (L.) Lamk. & Mill.	Zi
	Cucurbitales	Cucurbitaceae	*Lagenaria siceraria* (Mol.) Standl.	Bu thi
	Sapindales	Anacardiaceae	*Mangifera indica* L.	Tha yet
		Rutaceae	*Citursaurantifolium* (Christm.)	Than baya
	Malvales	Malvaceae	*Hibiscus esculentus* L.	Yon bade
	Brassicales	Brassicaceae	*Brassica oleracea* L. sub.sp. *gemmifera*	Mon lar htoke
	Solanales	Solanaceae	*Capsicum annuum* L.	Nga yoke
			Lycopersicum esculentum L.	Kha yan chin
			Solanum tuberosum L.	A lu
	Lamiales	Pedaliaceae	*Sesamum indicum* L.	Hnan
		Lamiaceae	*Mentha arvensis* L.	Bu di nan
	Apiales	Apiaceae	*Coriandrum sativum* L.	Nan nan

1. Scientific name - *Allium cepa* L.
   Family - Liliaceae
   Myanmar name - Kyet thun ni
   Snacks name - Ah kyaw sone, Mohinga, Ohnnoh khauk swe, Tofu thoke, Mont ti thoke, Kyarsan chet

2. Scientific name - *Allium sativum* L.
   Family - Liliaceae
   Myanmar name - Kyet thun byu
   Snacks name - Mohinga,Ohnnoh khauk swe, Mont lin maya, Tofu thoke, Mont ti thoke, Si hta min, Kyarsan chet

3. Scientific name - *Borassus falbellifer* L.
   Family - Arecaceae
   Myanmar name - Htan
   Snacks name - Mont kya si, Mont lone yae paw, Htan thi mont, Tha gu yo, Hhget pyaw paung, Mont ohn hnauk, Mont pya tha let ah ni, Mont si kyaw, Mont let kauk, Mye pe yo, Hnan yo, San to fu, Mont let saung, Kauk hnyin kwet kyaw, Kauk mont, Ohn yo, Ohn pa mont, Paukpauk sok, Kalape chaung, Mont lon gyi kyaw, Bein mont, Zi htan hnyet, Mont kywe thae, Mont pauk kyaw

4. Scientific name - *Coscos nucifera* L.
   Family - Arecaceae
   Myanmar name - Ohn
   Snacks name - Mont kya si, Mont lone yae paw, Htan thi mont, Ohnnoh khauk swe, Mont kya si, Tha gu yo, Hhget pyaw paung, Kauk nyin kyitauk, Mont ohn hnauk, Hta ma ne, Mont let kauk, Shwe yin aye, Mont let saung, Kauk mont, Ohn pa mont, Sanwin making, Hin htoke, Pa mont kyaw, Hnget pyaw kyaw, Hta pa na htoke, Bein mont, Mont thine chone, Mont kywe thae, Mont pauk kyaw

5. Scientific name - *Metroxylon sagu* Roxb.
   Family - Arecaceae
   Myanmar name - Tha gu
   Snacks name - Tha gu yo, Shwe yin aye

6. Scientific name - *Musa sapientum* L.
   Family - Musaceae
   Myanmar name - Hnget pyaw
   Snacks name - Mohinga, Hhget pyaw paung, Hnget pyaw sanwin making, Hnget pyaw kyaw

7. Scientific name - *Curcuma longa* Koerig.
   Family - Zingiberaceae
   Myanmar name - Na nwin
   Snacks name - Mohinga, Ohnnoh khauk swe,Tofu thoke, Mont ti thoke, Si hta min, Kyarsan chet

8. Scientific name - *Zingiber officinale* Rosc.
   Family - Zingiberaceae
   Myanmar name - Gyin
   Snacks name - Ah kyaw sone, Mohinga, Ohnnoh khauk swe, Kyarsan chet, Hta ma ne

9. Scientific name - *Cephalostachyum pergracile* Munro.
   Family - Poaceae
   Myanmar name - Paung thin wa
   Snacks name - Kauk nyin kyi tauk

10. Scientific name - *Cymbopogon citratus* Stapf.
    Family - Poaceae
    Myanmar name - Sabalin
    Snacks name - Mohinga

11. Scientific name - *Oryza sativa* L.
    Family - Poaceae
    Myanmar name - Saba
    Snacks name - Ah kyaw sone, Yae mont, Mont kya si, Mont lone yae paw, Htan thi mont,Mohinga, Mont lin maya, Mont ti thoke, Mont ohn hnauk, Mont pya tha let ah phyu, Mont pya tha let ah ni, Mont si kyaw, San to fu, Shwe yin aye, Mont let saung, Kauk hnyin kwet kyaw, Mont let kauk, Kauk mont, Pauk pauk sok, Hin htoke, Mont lon gyi kyaw, Hta pa na htoke, Bein mont, Pe kat kyaw, Pe paung, Mont kywe thae, Mont pauk kyaw, Hnget pyaw kyaw.

12. Scientific name - *Oryza sativa* L. var. *fatua* Prain.
    Family - Poaceae
    Myanmar name - Kauk hnyin
    Snacks name - Ah kyaw sone, Yae mont, Mont kya si, Mont lone yae paw, Kauk nyin paung, Mont lin maya, Si hta min,Kauk nyinkyi tauk, Mont ohn hnauk, Mont pya tha let ah phyu, Mont pya tha let ah ni, Mont si kyaw, Hta ma ne, Mont let kauk, Pe sein kyaw, Hnget pyaw sanwin making, Hin htoke, Mont lon gyi kyaw, Hta pa na htoke, Pe kat kyaw, Pe paung, Mont pauk kyaw Hnget pyaw kyaw.

13. Scientific name - *Saccharum officinarum* L.
    Family - Poaceae
    Myanmar name - Kyan
    Snacks name - Mont sat tha phu, Hhget pyaw paung, Kauk nyin kyi tauk, Shwe yin aye, Sanwin making, Hnget pyaw sanwin making, Kayay kaya, Pa mont kyaw, Hnget pyaw kyaw, Hta pa na htoke, Mont thine chone

14. Scientific name - *Triticum aestivum* L.
    Family - Poaceae
    Myanmar name - Gyone
    Snacks name - Mohinga, Ohnnoh khauk swe, Shwe yin aye, Sanwin making, Pa mont kyaw, Hnget pyaw kyaw, Mont thine chone

15. Scientific name - *Zea mays* L.
    Family - Poaceae
    Myanmar name - Pyaung
    Snack name - Ah kyaw sone

16. Scientific name - *Papaver somniferum* L.
    Family - Papaveraceae
    Myanmar name - Bein
    Snacks name - Sanwin making, Hnget pyaw sanwin making, Bein mont

17. Scientific name - *Vitis vinifera* L.
    Family - Vitaceae
    Myanmar name - Sa pyit
    Snacks name - Shwe yin aye, Sanwin making

18. Scientific name - *Arachis hypogaea* L.
    Family - Fabaceae
    Myanmar name - Mye pe
    Snacks name - Ah kyaw sone, Yae mont, Ohnnoh khauk swe, Mont lin maya, Mont ti thoke, Si hta min, Mont si kyaw, Kyarsan chet, Hta ma ne,Mye pe yo, Pe sein kyaw, Kalape chaung, Sanwin making, Hnget pyaw sanwin making, Mont lon gyi kyaw, Pa mont kyaw, Hnget pyaw kyaw, Hta pa na htoke, Bein mont, Mont thine chone, Ahlu kyaw, Pe kat kyaw, Sa kalay khway, Mont pauk kyaw

19. Scientific name - *Cicer arietinum* L.
    Family - Fabaceae
    Myanmar name - Kalape
    Snacks name - Ah kyaw sone, Mohinga, Ohnnoh khauk swe, Tofu thoke, Mont ti thoke, Kyarsan chet, Kalape chaung, Pe kat kyaw, Sa kalay khway

20. Scientific name - *Phaseolus mungo* L.
    Family - Fabaceae
    Myanmar name - Mat pe
    Snack name - Ah kyaw sone

21. Scientific name - *Phaseolus radiates* L.
    Family - Fabaceae
    Myanmar name - Pe di sein
    Snacks name - Yae mont

22. Scientific name - *Pisum sativum* L.
    Family - Fabaceae
    Myanmar name - Sadawpe
    Snacks name - Yae mont, Kauk nyin paung, Mont lin maya, Mont pyatha let ah phyu, Pe sein kyaw

23. Scientific name - *Vigna catjang* Walp.
    Family - Fabaceae
    Myanmar name - Pe lun
    Snacks name - Ah kyaw sone, Mont ohn hnauk, Mont lon gyi kyaw, Pe paung

24. Scientific name - *Tamarindus indica* L.
    Family - Fabaceae
    Myanmar name - Ma gyi
    Snacks name - Ah kyaw sone, Mont lin maya, Tofu thoke

25. Scientific name - *Zizyphus jujuba* (L.) Lamk. & Mill.
    Family - Rhamnaceae
    Myanmar name - Zi
    Snacks name - Zi htan hnyet

26. Scientific name - *Lagenaria siceraria* (Mol.) Standl.
    Family - Cucurbitaceae
    Myanmar name - Bu thi
    Snacks name - Ah kyaw sone

27. Scientific name - *Mangifera indica* L.
    Family - Anacardiaceae
    Myanmar name - Tha yet
    Snacks name - Tha yet pya

28. Scientific name - *Citrus aurantifolium* (Christm.)
    Family - Rutaceae
    Myanmar name - Thanbaya
    Snacks name - Mohinga, Ohnnoh khauk swe, Mont ti thoke, Kyarsan chet

29. Scientific name - *Hibiscus esculentus* L.
    Family - Malvaceae
    Myanmar name - Yon bade
    Snacks name - Ah kyaw sone

30. Scientific name - *Brassica oleracea* L. sub.sp. *gemmifera*
    Family - Brassicaceae
    Myanmar name - Mon lar htoke
    Snacks name - Ah kyaw sone, Tofu thoke

31. Scientific name - *Capsicum annuum* L.
    Family - Solanaceae
    Myanmar name - Nga yoke
    Snacks name - Ah kyaw sone, Yae mont, Mohinga, Mont lin maya, Tofu thoke, Mont ti thoke, Kyarsan chet

32. Scientific name - *Lycopersicum esculentum* L.
    Family - Solanaceae
    Myanmar name - Kha yan chin
    Snack name - Yae mont

33. Scientific name - *Solanum tuberosum* L.
Family - Solanaceae
Myanmar name - A lu
Snacks name - Ah kyaw sone, Ahlu kyaw

34. Scientific name - *Sesamum indicum* L.
Family - Pedaliaceae
Myanmar name - Hnan
Snacks name - Mohinga, Kauk nyin paung, Tofu thoke, Si hta min, Mont si kyaw, Hta ma ne, Hnan yo, San to fu, Ohn yo, Kalape chaung, Bein mont

35. Scientific name - *Mentha arvensis* L.
Family - Lamiaceae
Myanmar name - Bu di nan
Snacks name - Ah kyaw sone

36. Scientific name - *Coriandrum sativum* L.
Family - Apiaceae
Myanmar name - Nan nan
Snacks name - Yae mont, Mohinga, Ohnnoh khauk swe, Mont lin maya, Tofu thoke, Mont ti thoke, Mont pya tha let ah phyu, Kyarsan chet

Table 2. Number of specific uses cited by research participants for some snacks

No.	Myanmar name	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
1	Kyet thun ni	96					99	98			99	90										97					
2	Kyet thun byu						99	81		97	99	90		94								97					
3	Htan			53	98	97									86	89		85		92	92			96	88	92	89
4	Ohn			53	98	97		81					24		86	89	88	85					89	96			
5	Tha gu														86												
6	Hnet pyaw						99									89											
7	Na nwin						99	81			99	90		94								97					
8	Gyin	96					99	81														97	89				
9	Paung thin wa																88										
10	Sabalin						99																				
11	Saba	96	91	53	98	97	99			97		90						85	91	92	92			96			89
12	Kauk hnyin	96	91	53	98				94	97			24	94			88	85	91	92	92		89	96			
13	Kyan												24			89	88										
14	Gyone						99	81																			
15	Pyaung	96																									
16	Bein																										
17	Sa pyit																										
18	Mye pe	96	96					81		97		90		94							92	97	89		88		
19	Kalape	96					99	81			99	90										97					
20	Mat pe	96																									
21	Pe di sein		91																								
22	Sadawpe		91						94	97									91								
23	Pe lun	96																85									
24	Ma gyi	96								97	99																
25	Zi																										
26	Bu thi	96																									
27	Tha yet																										
28	Thanbaya						99	81				90										97					
29	Yon bade	96																									
30	Mon lar htoke	96									99																
31	Nga yoke	96	91				99			97	99	90										97					
32	Kha yan chin		91																								
33	A lu	96																									
34	Hnan						99		94		99			94							92		89			92	89
35	Bu di nan	96																									
36	Nan nan		91				99	81		97	99	90							91			97					

1.Ah kyaw sone, 2. Yae mont, 3. Mont kya si, 4. Mont lone yae paw, 5. Htan thi mont, 6. Mohinga, 7.Ohnnoh khauk swe,8.Kauk nyin paung, 9. Mont lin maya,10. Tofu thoke, 11. Mont ti thoke, 12.Mont kya si, 13. Si hta min, 14. Tha gu yo, 15. Hhget pyaw paung, 16. Kauk nyin kyi tauk, 17. Mont ohn hnauk,18. Mont pya tha let ah phyu, 19. Mont pya tha let ah ni,20. Mont si kyaw, 21. Kyarsan chet, 22. Hta ma ne, 23. Mont let kauk, 24. Mye pe yo, 25. Hnan yo, 26. San to fu

Table 2. Continued

No.	Myanmar name	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52
1	Kyet thun ni																										
2	Kyet thun byu																										
3	Htan		91		88	91	88	88	89	91					91				80	92						90	38
4	Ohn	86	91			91		88				96		70		76		40	80		51					90	38
5	Tha gu	86																									
6	Hnet pyaw												73				91										
7	Na nwin																										
8	Gyin																										
9	Paung thin wa																										
10	Sabalin																										
11	Saba	86	91		88	91			89					70	91		91	40	80				89		79	90	38
12	Kauk hnyin			92									73	70	91		91	40					89		79		38
13	Kyan	86										96	73	70		76		40			51						
14	Gyone	86										96				76					51						
15	Pyaung																										
16	Bein											96	73						80								
17	Sa pyit	86										96															
18	Mye pe			92						91		96	73		91	76	91	40	80		51	93	89	94			38
19	Kalape									91													89	94			
20	Mat pe																										
21	Pe di sein																										
22	Sadawpe			92																							
23	Pe lun														91										79		
24	Ma gyi																										
25	Zi																			92							
26	Bu thi																										
27	Tha yet										84																
28	Thanbaya																										
29	Yon bade																										
30	Mon lar htoke																										
31	Nga yoke																										
32	Kha yan chin																										
33	A lu																					93					
34	Hnan						88			91									80								
35	Bu di nan																										
36	Nan nan																										

27. Shwe yin aye, 28. Mont let saung, 29. Pe sein kyaw, 30. Kauk hnyin khwet, 31. Kauk mont, 32. Ohn yo, 33. Ohn pa mont,34. Pauk pauk sok, 35. Kalape chaung, 36.Tha yet pya, 37. Sanwin makin, 38. Hnget pyaw sanwin makin, 39. Kayay kaya,40. Mont lon gyi kyaw, 41. Pa mont kyaw, 42. Hnget pyaw kyaw, 43. Hta pa na htoke, 44. Bein mont, 45. Zi htan hyet,46. Mont thine chone, 47. Ahlu kyaw, 48. Pe kat kyaw, 49. Sa kalay khway, 50. Pe paung, 51. Mont kywe thae, 52. Mont pauk kyaw

Table 3. Use value and ranking of 36 plants species used in some snacks

No.	Scientific name	Myanmar name	Use value	Rank
1	*Allium cepa* L.	Kyet thun ni	5.79	1
2	*Allium sativum* L.	Kyet thun byu	6.57	1
3	*Borassus falbellifer* L.	Htan	20.74	1
4	*Coscos nucifera* L.	Ohn	17.83	1
5	*Metroxylon sagu* Rotb.	Tha gu	1.72	1
6	*Musa sapientum* L.	Hnet pyaw	3.52	1
7	*Curcuma longa* Koerig.	Na nwin	5.6	1
8	*Zingiber officinale* Rosc.	Gyin	4.62	1
9	*Cephalostachyum pergracile* Munro	Paung thin wa	0.88	2
10	*Cymbopogon citratus* Stapf.	Sabalin	0.99	2
11	*Oryza sativa* L.	Saba	23.79	1
12	*Oryza sativa* L. var. *fatua* Prain.	Kauk hnyin	19.43	1
13	*Saccharum officinarum* L.	Kyan	6.93	1
14	*Triticum aestivum* L.	Gyone	4.89	1
15	*Zea mays* L.	Pyaung	0.96	2
16	*Papaver somniferum* L.	Bein	2.49	1
17	*Vitis vinifera* L.	Sa pyit	1.82	1
18	*Arachis hypogaea* L.	Mye pe	20.15	1
19	*Cicer arietinum* L.	Kalape	8.36	1
20	*Phaseolus mungo* L.	Mat pe	0.96	2
21	*Phaseolus radiates* L.	Pe di sein	0.91	2
22	*Pisum sativum* L.	Sadawpe	4.65	1
23	*Vigna catjang* Walp.	Pe lun	3.51	1
24	*Tamarindus indica* L.	Ma gyi	2.92	1
25	*Zizyphus jujuba* (L.) Lamk. & Mill.	Zi	0.92	2
26	*Lagenaria siceraria* (Mol.) Standl.	Bu thi	0.96	2
27	*Mangifera indica* L.	Tha yet	0.84	2
28	*Cirurs aurantifolium* (Christm.)	Thanbaya	3.67	1
29	*Hibiscus esculentus* L.	Yon bade	0.96	2
30	*Brassica oleracea* L. sub.sp. *gemmifera*	Mon lar htoke	1.95	1
31	*Capsicum annuum* L.	Nga yoke	6.69	1
32	*Lycopersicum esculentum* L.	Kha yan chin	0.91	2
33	*Solanum tuberosum* L.	A lu	1.89	1
34	*Sesamum indicum* L.	Hnan	10.17	1
35	*Mentha arvensis* L.	Bu di nan	0.96	2
36	*Coriandrum sativum* L.	Nan nan	7.45	1

1.0 and above = 1st group

0.51-0.99 = 2nd group

0.1-0.5 = 3rd group

The comparison on the use value (UV) of the presented plants was calculated as Phillips (1996). According to the calculation of use value, 25 plants species were observed in first ranking. Eleven species were observed in second ranking and third ranking was not observed in the study. The highest use value was observed in *Oryza sativa*L. (Saba) showed the first rank and use value (UV = 23.79) and then followed by*Borassus flabellifer* L. (Htan), *Arachishypogaea* L. (Mye pe), *Oryza sativa*L. var. *fatua* Prain. (Kauk hnyin), *Coscos nucifera* L. (Ohn) showed use value (UV= 20.74, 20.15, 19.43, 17.83) respectively. *Mangifera indica*L. showed the least use value (UV = 0.84). Use values of plants were shown in Table 3.

Discussion and Conclusion

The present research deals with some Myanmar snacks found in Banmaw City. Altogether 36 species which belong to 33 genera of 18families have been studied in the area. In the sub-classMagnoliidae, 14 orders and 18 families have been recorded.

According to the result of the calculation of use value of the 36 species were categorized into 3 groups (1^{st}, 2^{nd}, and 3^{rd} ranking) by using the method of Phillip (1996). It was observed that the plants belonging to 1^{st} ranking were the most useful snacks in eating culture for Myanmar people and 3^{rd} ranking was not found in the study as shown in Table 3. In the 1^{st} ranking plants, *Oryza sativa*L. (Saba) showed the highest value (UV = 23.79). Most of the participants were used more than other plants because rice was used as main staple food for Myanmar people.

According to survey, *Oryza sativa*L. (Saba), *Borassus flabellifer* L. (Htan), *Arachishypogaea* L. (Mye pe), *Oryza sativa*L. var. *fatua* Prain. (Kauk hnyin), *Coscos nucifera* L. (Ohn) were found that they were the most useful plant species in Myanmar snacks and theuse value UV= 23.79, 20.74, 20.15, 19.43, 17.83 respectively. 16 species were used in Ah kyaw sone, 13 species were used in Mohinga and 10 species were also used in Ohnnoh khauk swe. 9 species were used in Tofu thoke, Mont ti thoke and Kyarsan chet. 8 species were also used in Yae mont and Mont linmaya. 6 species were used in Shwe Yin Aye, Bein mont and Sanwin makin. Si hta min, Mont ohn hnauk, Mont si kyaw, Hta ma ne, Hnget pyaw sanwin makin, Mont lon gyi kyaw, Hta pa na htoke and Mont pauk kyaw have been used 5 species. Four species were used in twelve snacks such as Mont kya si, Mont lone yae paw, Hnget pyaw paung, Kauk nyin kyi tauk, Mont pya tha let ah phyu, Mont let kauk, Kalape chaung, Hin htoke, Pa mont kyaw, Hnget pyaw kyaw, Mont thine chone and Pe kat kyaw. Three species were used in eleven snacks namely Htan thi mont, Kauk nyin paung, Mont kya si, Tha gu yo, Mont pya tha let ah ni, Mont kaung ohn, Mont let saung, Pe sein kyaw, Kauk mont, Pe paung and Mont kywe thae.

Ethnobotanical study on some Myanmar snacks help the maintainance of culture of residence in Banmaw city. This study showed that most of the species recorded are of ethnobotanical importance which is paramount of conservation on the degradation of culture.

Acknowledgements

I would like to express my profound gratitude to Professor Dr Maung Thynn, (Retired Rector) for introducing the subject Ethnobotanical research. I am greatly indebted to Dr Aung Kyaw Thin (Prorector), and Dr Aye Aye Han (Prorector) Banmaw University for providing me the necessary facilities. I would like to acknowledge the contribution of all the informants for their valuable knowledge.

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Isolation of Pathogenic Fungi from the Leaves and Fruits of Banana and Papaya Plants

Win Naing*

Abstract

The present study deals with the investigation of pathogenic fungi from the leaves and fruit of (*Musa acuminata* L.) banana and (*Carica papaya* L.) papaya plants. In this study, plants specimens were collected, carefully processed and inoculated on PDA media plates. In the course of isolation of pathogenic fungi, especially two kinds of pathogenic fungi *Alternaria* and *Fusarium* were isolated from the leaves of banana plants and two kinds of pathogenic fungi *Helminthosporium* and *Curvularia* were isolated from the leaves of papaya plants. The pathogenic fungi *Aspergillus* was isolated from the fruits of banana and papaya plants. Their morphological and microscopical characters were presented.

Keywords- Pathogenic fungi

Introduction

Banana (*Musa acuminata* L.) is among the most important crops in tropical and subtropical climates that cultivation in 120 countries of the world. It is one of the most important tropical fruits in Southeast of Iran (Amani, 2002).

Banana plants with *Fusarium* wilt can be identified by the conspicuous yellowing and wilting of older leaves which progress to the youngest leaves until affected plants are eventually killed. The most characteristic symptom of banana *Fusarium* wilt is chlorosis (yellowing) of older banana leaves that progress upward.

Fungal pathogens isolated and identified from the decaying crowns of banana were *Colletotrichum musae, A.flavous, A.niger,* and *Rhizopus spp* were frequently isolated from all four districts, *Fusarium* spp. and *Penicillium* spp from three districts out of the four districts. (Finlay and Brown, 1993).

Papaya (*Carica papaya* L.) is one of the most important fruits cultivated throughout the tropical and subtropical regions of the world.

It is consumed at unripe and ripe stages. The edible portion of the ripe papaya fruit contains Na, K, Ca, Mg, P, Fe, Cu, Zn and Mn. It is a source of carotenoids, vitamin C, thiamine, riboflavin, niacin, vitamin B-6 and vitamin K (Bari *et al*., 2006).

The fungus is highly pathogenic to *Carica papaya* leaves under artificial inoculation. Typical symptoms appear on the leaves in 6 to 10 days. Black fruiting bodies of the fungus are also prominent on both the surfaces of the infected region. The diseased portions become fragile and dissociate themselves (Ullasa *et al.,* 1974).

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Aims and Objectives

- To understand the fundamental facts and principles necessary in microbiology
- To inform the isolation of pathogenic fungi from *Musa acuminata* L. and *Carica papaya* L.
- To know the importance factors of physical and chemical requirement for the growth of pathogenic fungi.

Materials and Methods

Materials required

Infected young leaves, sterile Petri-dishes, PDA slants, (1%) mercuric chloride solution, sterile water, razor blade, forceps, inoculation needle, burner/spirit lamp, spirit, incubator, PDA medium and autoclave (pressure steam sterilizer).

Sample collection

In this study, the samples were put in plastic bags and kept in a refrigerator pending laboratory examination. Leaf tissues with advanced symptoms of leaf spot were cut into squares of approximately 20×10 cm and then were sent to laboratory. In the laboratory samples were first washed then cut into small pieces and surface sterilized with 1% mercuric chloride solution for 2 minutes; washed in sterilized water and then dried between two sterilized filter papers (Johnson 2012).

Preparation of Potato Dextrose Agar (PDA) Medium

Potato	- 250g
Dextrose	- 15g
Agar	- 18g
Distilled water	- 1000ml

Isolation procedure for pathogenic fungi

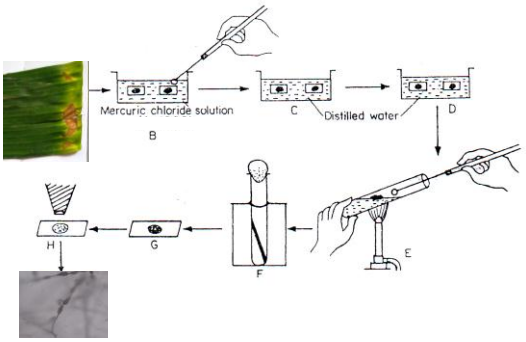

Figure 1. Step for isolation of plant pathogen

RESULTS

Isolation and identification pathogenic fungi

Macroscopical characters of *Alternaria*

This pathogenic fungi was isolated from banana leaves on potato dextrose agar (PDA) as a pure culture. Colonies on PDA were buff initially, later turning to dark brown, fast growing (2.5 cm to 3.5 cm in diameter at 3 day old culture) and had well-developed aerial mycelia (Figure 2).

Microscopical characters of *Alternaria*

The fungus produced profusely branched, brownish, septate mycelia. Conidiophores arose singly. Conidia formed in long chains (often branched), oval to ellipsoidal, with 2 - 7 transverse and 1- 4 longitudinal or oblique septa, tapering gradually to form a short swollen beak at the apex (Figure 2).

Macroscopical characters of *Fusarium*.

This pathogenic fungi was isolated from banana leaves on potato dextrose agar (PDA) as a pure culture. Colonies on PDA were buff initially, later turning to white, fast growing (2.0 cm to 2.5 cm diameter at 3 day old culture) and had well-developed aerial mycelia (Figure 3).

Microscopical characters of *Fusarium*.

The fungus produced, septate mycelia. Conidiophores brown, simple; conidia dark, end cells lighter, 3-5 septate, more or less fusiform, typically bent or curved (Figure 3).

Macroscopical characters of *Helminthosporium*

This pathogenic fungi was isolated from papaya leaves on potato dextrose agar (PDA) as a pure culture. Colonies on PDA were white initially, later turning to dark, fast growing (2.5 cm to 3.5 cm diameter at 5 days old culture) and had well developed aerial mycelia. (Figure 5)

Microscopical characters of *Helminthosporium*

Mycelium light to dark in culture, extensive; conidiophores short or long, septate, simple or branched, more or less irregular or bent, bearing conidia successively on new growing tips; conidia dark, typically containing more than 3 cells, cylindrical or ellipsoid, sometimes slightly curved or bent, ends rounded. (Figure 5)

Macroscopical characters of *Curvularia*

This pathogenic fungi was isolated from papaya leaves on potato dextrose agar (PDA) as a pure culture. Colonies on PDA were buff initially, later turning to white, fast growing (2.0 cm to 2.5 cm diameter at 3 day old culture) and had well developed aerial mycelia. (Figure 6)

Microscopical characters of *Curvularia*

The fungus produced profusely branched, brownish, septate mycelia. Conidiophores brown, simple; conidia dark, end cells lighter, 2 to 3 celled, more or less fusiform, typically bent or curved, with one or two of the central cells enlarged. (Figure 6)

Macroscopical characters of *Aspergillus*

This pathogenic fungi was isolated from banana fruit on potato dextrose agar (PDA) as a pure culture. Colonies on PDA were pale brown initially, later turning to brown, fast growing (2.0 cm to 2.5 cm diameter at 3 day old culture) and had well developed aerial mycelia (figure 4 & 7).

Microscopical characters of *Aspergillus*

Conidiophores upright, simple, terminating in a globose or calvate swelling, bearing phialides at the apex or radiating from the entire surface; conidia 1-celled, globose, often variously colored in mass, produced basipetally (figure 4 & 7).

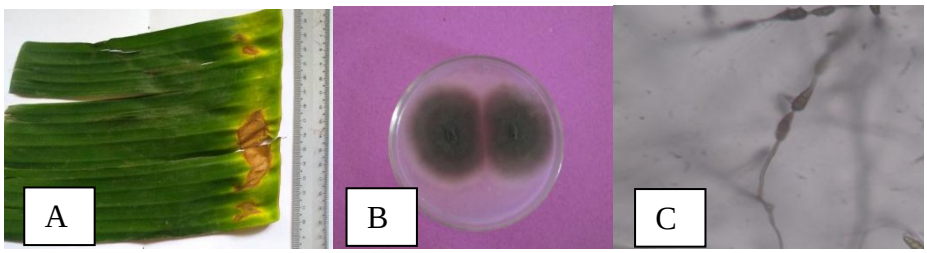

Figure 2. A. Symptoms of *Alternaria* leaf blight on surface of banana leaf

B. Morphological character of *Alternaria*

C. Microscopical character of *Alternaria*

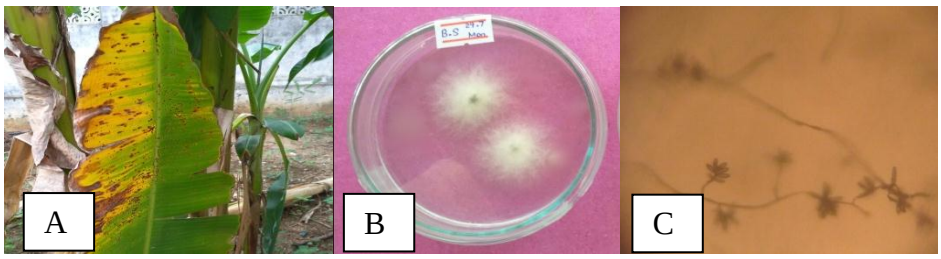

Figure 3. A. Symptoms of *Fusarium* leaf spot on surface of banana leaf

B. Morphological character of *Fusarium*

C. Microscopical character of *Fusarium*

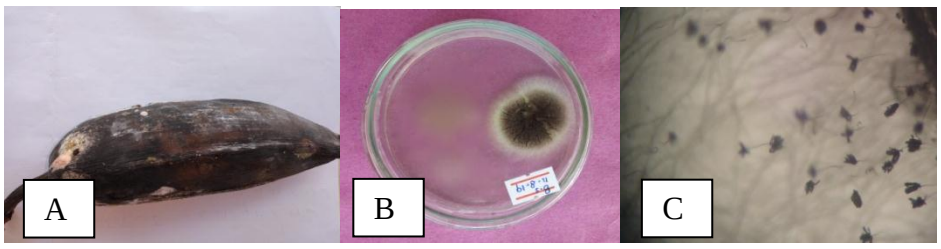

Figure 4. A. Symptoms of *Aspergillus* fungus on surface of banana fruit

B. Morphological character of *Aspergillus*

C. Microscopical character of *Aspergillus*

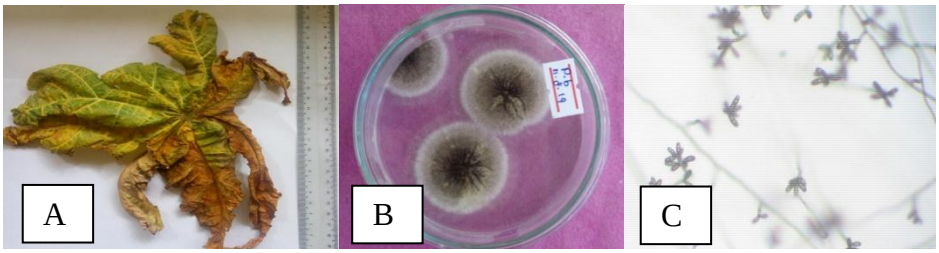

Figure 5. A. Symptoms of *Helminthosporium* leaf blight on surface of papaya leaf

B. Morphological character of *Helminthosporium*

C. Microscopical character of *Helminthosporium*

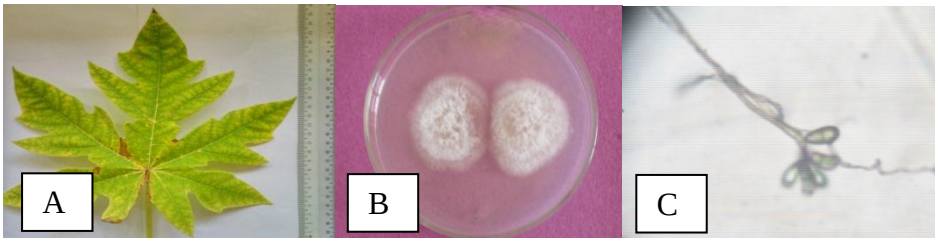

Figure 6. A. Symptoms of *Curvularia* leaf spot on surface of papaya leaf

B. Morphological character of *Curvularia*

C. Microscopical character of *Curvularia*

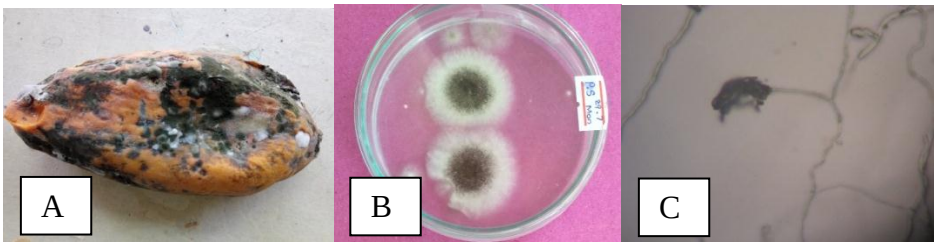

Figure 7. A. Symptoms of *Aspergillus* on surface of papaya fruit

B. Morphological character of *Aspergillus*

C. Microscopical character of *Aspergillus*

Discussion and Conclusion

In thus study, the isolation of pathogenic fungi from the leaves and fruit of banana and papaya plants during the period of December-2019 to January- 2020. Isolated pathogenic fungi were identified by some key with help of standard books, Barnett 1956.

In the course of isolation, two kinds of pathogenic fungi *Alternaria* and *Fusarium* were isolated from the leaves of banana plants. Two kinds of pathogenic fungi *Helminthosporium* and *Curvularia* were isolated from the leaves of papaya plants. *Aspergillus* pathogenic fungi were isolated from the fruits of banana and papaya plants. In this investigation, their macroscopical and microscopical characters are showed in table.

pathogenic fungi	Mycelium	Media	Conidiophores	Conidia
Alternaria	Dark brown, colonies reach 2.5 to 3.5 cm diameter	PDA	Conidiophores dark, simple short or elongate typically bearing a simple or branched chain or conidia	conidia dark, typically with both transverse and longitudinal septa
Fusarium	White, fast growing (2.0 cm to 2.5 cm diameter	PDA	Conidiophores brown, simple	conidia dark, 3-5 septate, more or less fusiform, bent or curved.
Helmintho-sporium	light to dark in culture, extensive	PDA	conidiophores short or long, septate, simple or branched, more or less irregular or bent	conidia dark, more than 3 cells, cylindrical or ellipsoid
Curvularia	Pale brown, colonies reach 2.0 to 2.5cm diameter	PDA	Conidiophores brown, simple or sometimes branched	conidia dark, 3 to 5 celled, more or less fusiform
Aspergillus	Pale brown to dark brown, fast growing (2.0 cm to 2.5 cm diameter)	PDA	Conidiophores upright, simple, terminating in a globose	conidia 1-celled, globose, often variously colored in mass, produced basipetally.

According to Jones 2000, *Alternaria alternata* (Leaf spot agent) and species *Fuasarium* were isolated from stem, root and leaf tissue of banana for the first time from Iran.

Reports of fungi from the genus *Alternaria* occurring on (*Musa acuminata* L) banana plants and causing spots symptoms come from the United States. (Tylkowska *et al*., 2003).

According to Srivastava and Bilgrami 1963, the *Curvularia* pathogenic fungus was isolated from the leaves spots of *Carica papaya*. In this research show the same pathogenic fungi were found.

Moreover, Snowdon, 1990 have been reported *Aspergillus* rot of pawpaw may be caused by various species of *Aspergillus*, e.g. *Aspergillus flavus* and *A. niger*. In this investigation *Aspergillus* fungus was found on the surface of papaya fruit.

I have chosen this study, because it is an effort to understand the pathogenic fungi from the leaves and fruit of banana plants.

The present studies pointed to the diversity of fungi, including pathogenic species, which as a result of injuring the plants- exerts a negative effect on the quality and quantity of *Musa acuminata* L. and *Carica papaya* L. papaya plants.

The negative aspect of the occurrence of *Alternaria, Fusarium, Helminthosporium* and *Curvularia* on banana and papaya leaves, in addition to reducing the amount of fruits yield by the pathogen in the tissues.

Acknowledgements

I would like to express my gratitude to Dr Myat Myat Ku, Professor and Head, Department of Botany, Banmaw University, for her permission, invaluable advice and providing all the department facilities to do this research.

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Some Desmids found in Banmaw Township, Kachin State

Thet Naing Htwe*

Abstract

In the present study, algae specimens were collected from the lakes of Banmaw Township, Kachin State during January 2020 to March 2020. The specimen collection sites were Gawya lake and Shwekyeenar pagoda lake. Among them, some desmids were recorded, identified, and classified in this study. Genus *Closterium, Cosmarium, Staurastrum, Staurodesmus, Euastrum* and *Spondylosium* were abundantly occurred. The total algal species were found 21 species, 6 genera, 1family and 1 order in this study area. Some species were new recorded. All specimens were described and presented in figures.

Keywords : Algae, desmids, some lakes

Introduction

Algae are widely present in freshwater environments, such as lakes and rivers, where they are typically present as microorganisms. Although relatively inconspicuous, they have a major importance in the freshwater environment, both in terms of fundamental ecology and in relation to human use of natural resources. It is important to study algal compositions of every habitat in each area for knowing beneficial algae, harmful algae, and water quality of water bodies of that area (Smith, 1950).

Desmids are highly diverse unicellular green algae that are primary producers in fresh water ecosystems, are consumed by microfauna and can serve as biological indicators of the biological health of fresh water bodies. Desmids are cosmopolitan microorganisms of tropical to arctic water bodies. Desmids are generally more common and diverse in oligotrophic lakes and ponds; however, they are highly sensitive to changes in the environmental parameters that could be considered as bio-indicators for monitoring water quality (Deka *et al.* 2011).

Study on algal flora is basic and important field of phycology. The algal floras of many countries were done by many. Smith (1950) pointed out the freshwater algae of United States. Prescott (1962) worked on the algal flora with about 1000 species in western great lake area. John *et al.* (2002) also reported the freshwater algal floral of the British Isles. Similarly, Myanmar algal flora of freshwater was also carried out by many researchers West & West (1907), Handa (1927) and Skuja (1949). Algal floras of ponds and lakes in Myanmar have been studied by previous researchers for many years.

Banmaw is a city of Kachin State in the northernmost part of Myanmar. It is located in 186 km south form the capital city of the state of Kachin. Banmaw has a climate that lies in the transition between humid subtropical climate and tropical savanna climate. Temperatures are very warm throughout the year, although the winter months are milder. In the present study, algae specimens and water samples were collected from some lakes in Banmaw Township during January 2020 to March 2020. Among them, some desmids was presented in this

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research paper. Soe Soe Win and Hkawn Tsin (2015) were reported that the algal flora of Kachin State. However, this research of Banmaw Township has not been studied. The aims of the present study are to identify and record the algal composition of Banmaw Township, to share the knowledge of algal flora found in this area, to give some desmid information to the person who work the applied algal researchers.

Materials and Methods

Study Area: Some lakes are situated in Banmaw Township, Kachin State, Myanmar. Banmaw Township lies between 24° 16' 0 N latitude and between 97° 41' 0 E longitude.

Collection of the Algae Specimens: Algae specimens were collected from some lakes in Banmaw Township as shown in figure 1. Algal species were collected during January 2020 to March 2020. Algal samples were collected from the upper surface of the water.

Data Collection of pH, GPS and Water Temperature: The positions of all sampling sites were measured by Global Position System (GPS) and temperature of water was measured by thermometer in the fields.

Laboratory Observation and Classification of Algae: Laboratory Observations of samples was made by using electric microscope at Department of Botany, Banmaw University, Banmaw Township, Kachin State, Myanmar. Collected species were presented by digital camera. The identification and taxonomic description have been done by referring on Skuja (1949), Smith (1950), Desikachary (1959), Prescott (1962), Philipose (1967), Vinyard (1979), Komarek (1985-1989), Dillard (1982-2000), Hoek *et al.* (1995), Graham & Wilcox (2000) and John *et al.* (2002). Arrangements of classification were done by John *et al.* (2002).

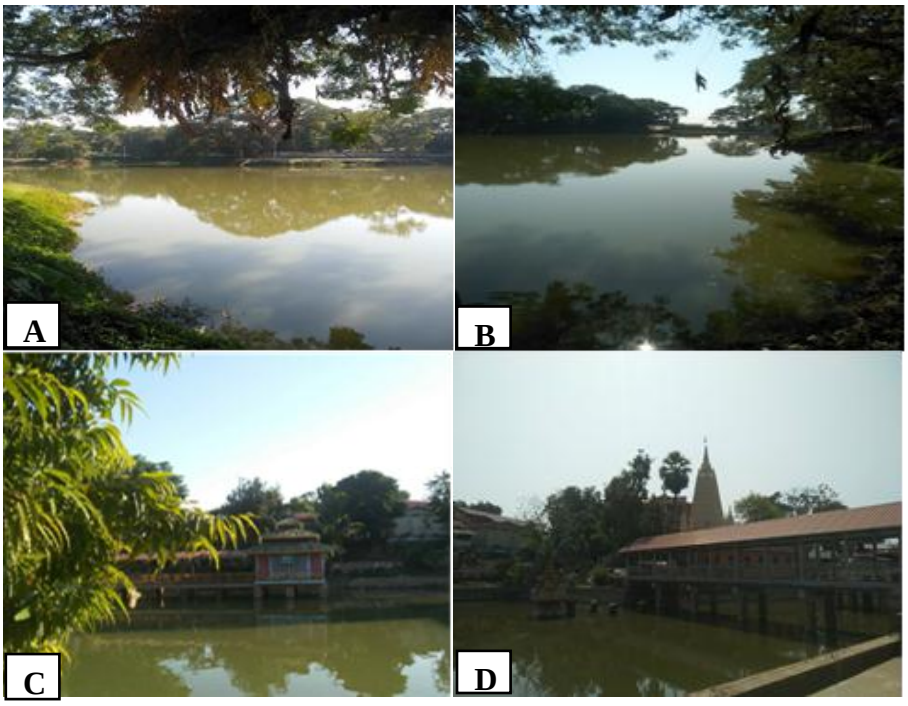

Figure 1. Sampling Sites of Some Lake
A. Site 1 (Gawya lake) B. Site 2 (Gawya lake)
C. Site 3 (Shwekyeenar pagoda) D. Site 4 (Shwekyeenar pagoda)

Results

Algal Flora:

In this research, totally 21 algal species were reported. The specimens of algae were collected from four sampling sites in some lakes, Banmaw Township. The collected specimens were identified. These algae belong to division Chlorophyta. In this study 21 species, 6 genera, 1 family belong to 1 order of Desmidiaceae were classified, recorded and described with photomicrographs. The classification of algae was mentioned in Table 1.

Table 1. Classification of desmid found in some lakes, Banmaw Township

No.	Division	Order	Family	Genus
1.	Chlorophyta	Desmidiales	Desmidiaceae	1. *Closterium*
				2. *Cosmarium*
				3. *Staurastrum*
				4. *Staurodesmus*
				5. *Euastrum*
				6. *Spondylosium*

ORDER DESMIDIALES

FAMILY DESMIDIACEAE

Desmids are mostly unicellular forms. The cell walls are in two equal sections that are adjoined at the midregion, forming two semicells are identical in respect to shape and ornamentation. In most genera, in the cells having medium incision, the sinus, where the two semicells add join, with a connecting isthmus between the two semicells (John *et al.* 2002).

1. Genus - *Closterium* Nitzsch ex Ralfs 1848 (Figure 2)

Cells always longer than broad, some straight and broadly spindle-shaped, more commonly exhibiting varying degrees of curvature; sometimes smooth from end to end, a straight and parallel-sided median section. Chloroplasts in narrowest species simple and ribbon-like in others acentral, axile core having radiating longitudinal ridges with varying numbers of pyrenoids in series along core (John *et al.* 2002).

2. Genus - *Cosmarium* Corda 1848 (Figure 2)

Basic shape 2 circles or semicircles joined by a central isthmus and except for a few species always showing some degree of compression in vertical view; in side view mostly ovoid or ellipsoidal, often with lateral swelling or protrusions and ornaments consisting of granules pits or ridges which may not be visible in face view; cells all have a medium sinus separating adjacent semicells, ranging from only a shallow notch to a very deep cleft, open or close in varying degrees; semicells in face view almost circular to semicircular, ovoid to trapeziform or pyramidal, with margin in front view smooth, undulate, granulate, or lightly incised; walls always punctate, sometimes very delicately so, although puntate may be large

and distinct and from which a wide mucilage envelop may be excreted, especially in species occurring in the plankton; walls smooth or bearing characteristic ornamentation of granules arranged in complex patterns, surface of others scrobiculate or with conical teeth, chloroplast mostly axile, forked and sometimes highly elaborate and complex (John *et al.* 2002).

3. Genus - *Staurastrum* (Meyen) Ralfs (Figure 3)

Semicells with upper angles considerably extended and showing radial symmetry, triangular in apical view; a few biradiated with bilaterally compressed cells, triangular, pentangular to 9-angular; isthmus deeply constricted; walls have a pore system and extrusion from pores, smooth and punctate or ornamented with granules, denticulations, verrucae or spines; arranged in consistent, symmetrical patterns; semicells in front view elliptical to semicircular, triangular, quadrangular to polygonal.

4. Genus - *Staurodesmus* Teiling 1967 (Figure 3)

Cells mostly triradiate, less biradiate or quadriradiate, bear a single spine varying in length and curvature; spines bending upwards (divergent) curving downwards towards isthmus (convergent) solids or hollow; walls smooth and having fairly distinctive pores. Most cells have a distinct medina constriction deep ranging from closed to widely open, sinus acute to obtuse; semicells vary from narrow to broadly ovoid, subkidney-shaped, cup-shaped, flask-shaped, half-moon-shaped to rectangular (Dillard 1982-2000).

5. Genus - *Euastrum* Ehrenberg (Figure 4)

Cells solitary, usually 1.5-2.0 times longer than wide, distinctly compressed in end and side views, usually with a conspicuous median narrow, vertical incision in the cell apices and with one or more facial protuberances that are especially evident in side view; median constriction usually deep, the sinus usually narrow and closed, the isthmus relatively narrow; semicells usually truncate-pyramidal in face view, mostly 3-lobed with 2 basal lobes and a polar lobe, with in some taxa, upper lateral lobules between the basal lobes and the polar lobe; end view more or less elliptical with rounded poles and with a definite protuberance between the poles, side view narrowly truncate-pyramidal with prominent inflations in the basal portion; cell wall smooth, punctate or subobiculate and frequently with granules on the face or on the margins of the lobes.

6. Genus - *Spondylosium* Brebisson ex Kutzing 1849 (Figure 4)

Cells laterally compressed so vertical view elliptical, usually deeply constricted, with narrow to broad sinus sometimes opening outwards; semicells differing considerably in shape, joined to adjacent cells by apices, but latter always lack even the smallest granular processes; apices mostly broadly truncate or retuse; walls usually without ornamentation; sometimes conspicuous pores excrete a thick enveloping mucilaginous sheath; filaments often long and twisted.

Figure 2. A. *Closterium* B. *Cosmarium spp.*
C. *Cosmarium spp.* D. *Cosmarium spp.*
E. *Cosmarium spp.* F. *Cosmarium spp.*

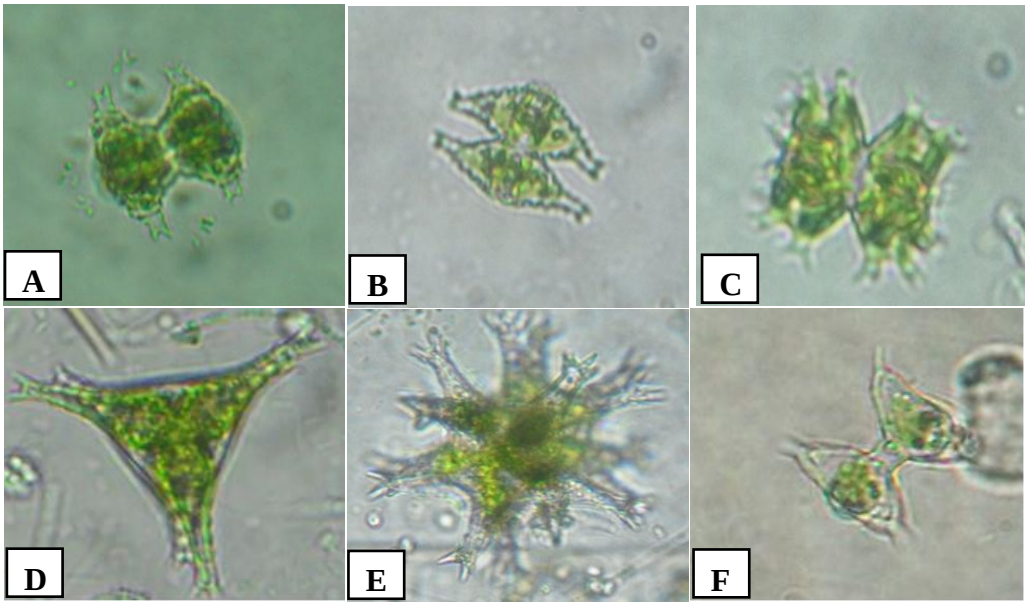

Figure 3. A. *Strastrum spp.* B. *Strastrum spp.*
C. *Strastrum spp.* D. *Strastrum spp.*
E. *Strastrum spp.* F. *Staurodesmus spp.*

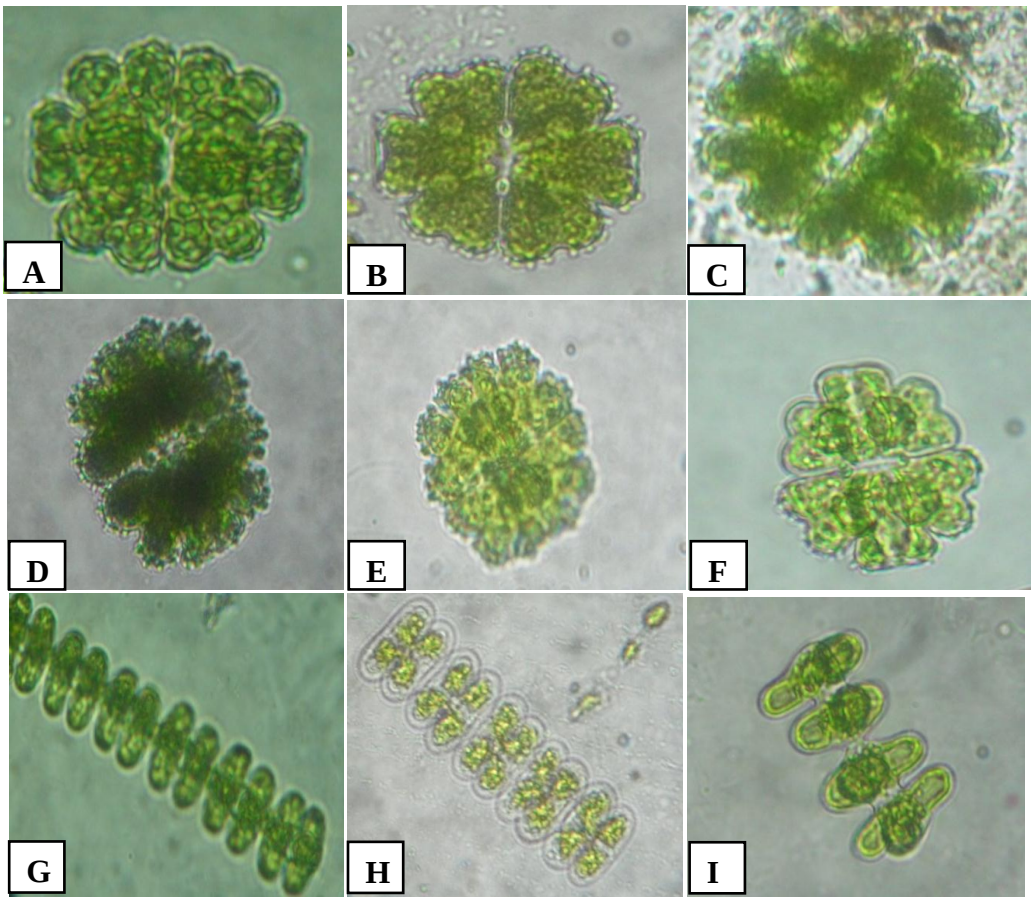

Figure 4. A. *Euastrum spp* B. *Euastrum spp*
C. *Euastrum spp* D. *Euastrum spp*
E. *Euastrum spp* F. *Euastrum spp*
G. *Spondylosium spp* H. *Spondylosium spp*
I. *Spondylosium spp*

Discussion

Freshwater algae are found in a large range of habitats. The freshwater ecosystem is of lotic and lentic types. The lotic system includes streams, canals, waterfalls, rivers and rivulets. The lentic system includes the pools, puddles, ponds, reservoirs, lakes and the agricultural fields like paddy fields. The freshwater ecosystem is differentiated into various types of planktons (free floating), benthos (attached to sediments) or epiphytic algae on stones, sand, mud and rock of reservoir and lakes (Anand *et al.* 2011). In the present study, some desmids of Banmaw township are great interest for having lentic types and lotic types in this area.

In this research, Gawyar Lake and Shwekyeenar Pagoda Lake from Banmaw Township, Kachin State were selected for study of some desmids. Total of collected 21 species of division Chlorophyta was observed during January 2020 to March 2020.

The present study showed 21 species belong to 6 genera of Chlorophyta. They were 1 species of *Closterium*, 5 species of *Cosmarium*, 5 species of *Strastrum*, 1 species of

Staurodesmus, 6 species of *Euastrum*, and 3 species of *Spondylosium* are found in this study area. In these genus, *Staurodesmus* and *Spondylosium* are occurred in Kachin State and not found in Mandalay region. Genus *Eurastrum* are abundantly observed in Banmaw Township. Some species are newly recorded.

In January, *Staurastrum* was abundantly occurred in site 1 and 2. *Cosmarium* and *Spondylosium* were commonly found in these sites. *Staurodesmus* was rarely occurred. In February and March, *Eurastrum* and *Cosmarium* were abundantly found in site 1, 2, 3 and 4. *Closterium* was commonly found in sites 2 and 3. *Staurodesmus* was rarely occurred in all sites. During three months, *Cosmarium and Eurastrum* were abundantly found in all sites. *Spondylosium* was occurred a few in sites 1, 2, 3 and 4.

Conclusion

Algae are very diverse and very applicable for the researchers like taxonomists, environmentalists and ecologists. Water temperature is regarded as one of the most important environmental factors that establish the growth and surviving of algae. The characteristic of growing range of each alga was according to minimum, optimum and maximum temperature values. In the present study, Chlorophyta was abundantly occurred in Banmaw Township. Among them, some desmids were newly recorded and presented in this research.

Nowadays, algae are widely used in many purposes all over the world such as medicine, functional food, aquaculture, cosmetics, biofertilizer and biofuel. Many others countries become interested in large amount production of algae. In Myanmar, a plenty of beneficial algae are found naturally.

It can be concluded that, different growth of algal population was depended on the temperature and pH value of water. The results of the present study will provide precious and beneficial information for natural environmental conservation in this study area.

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