

**Ministry of Education
Department of Higher Education (Lower Myanmar)
Taunggoke Degree College**

**Taunggoke Degree College
Research Journal**

Vol.1-B, No.1

October,2018.

Taunggoke Degree College Research Journal 2018

Vol. (1-B), No. 1

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A GEOGRAPHICAL ANALYSIS ON POPULATION DISTRIBUTION AND DENSITY IN URBAN AREA OF SHWEBO TOWNSHIP

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Abstract

This paper studies the population in urban areas of Shwebo Township, especially the population distribution and density which are affected by spatial variation. Moreover it is found that the area of the each quarter in Shwebo is directly related to population distribution. The functions of population cluster such as purified water supply, education and health care system, transportation and communication, work opportunity in cottage industry, marketing for local products and security lead to cause large and dense population. The largely populated area in Shwebo, Quarter (10), it is also the industrial zone and is situated near Shwebo University on the Shwebo-Myitkyina road and Shwebo-Kyaukmyaung-Singu (Mandalay Region) road. Therefore the accessibility of transportation and cottage industries are mainly influenced on population density. The densely populated area of Nwenein in Kyaukmyaung has large scale glaze factories in Myanmar.

Introduction

Shwebo Township is one of the 37 townships in Sagaing Region, which is in the Central Dry Zone of Myanmar. In the date of (13-9-2010) Kyaukmyaung was transformed to Sub-Township by combination of four quarters and ten village tracts (Ma-U, Onbauk, Shwegun, Tebin, Malar, Gwebingon, Kangyidaw, Makauk, Kalama, Sebingyun) including (17) villages. Thus Shwebo Township comprises Shwebo and Kyaukmyaung towns and 72 village tracts including 168 villages. It has a total population of 235,542 persons in 2014. Its population density per square mile is 571.44 persons in 2014. Shwebo and Kyaukmyaung are the urban areas of Shwebo Township.

Shwebo is a city in Sagaing Region, 110 km north-west of Mandalay between the Ayeyarwady and the Mu rivers. The city was the origin of the Konbaung Dynasty, established by King Alaungpaya in 1752, that was the dominant political force in Burma after the mid 18 th century. It served as Alaungpaya's capital from 1752 to 1760. It lies between north latitudes 22° 34' and east longitudes 95° 42'. It has an area of 3012 acres or 4.69 square miles. Shwebo is composed of (10) quarters and (50) wards. Shwebo has an area of (3012) acres or (4.69) square miles. Its population was 69,036 persons in 2014, of which 32,425 are male and 36,611 are female. Its population density was 14719.83 persons per square mile in 2014.

Kyaukmyaung lies between North Latitudes 22° 35' and East Longitudes 95° 57'. In the date of (13-9-2010), Kyaukmyaung was transformed to Sub-Township, Kyaukmyaung village tract become a town in Sagaing Region. It is situated 46 miles north of Mandalay on the west bank of the River Ayeyarwady, and 17 miles east of Shwebo by road. Kyaukmyaung is an inland port of the Ayeyarwady waterway from Mandalay to Katha. The Ayeyarwady River passes through for about 27 miles along the eastern boundary of the sub-township. It is not beneficial for irrigation system but it

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is important for waterways. Its depends on its transportation accessibility and agricultural productivity of "Ya" crops such as groundnut, sesame, sugarcane, pigeon pea, green gram and others. In addition, next attractive functions of Kyaungmyaung are fresh water fishing industry and inland waterways in the Ayeyarwady River. There are many seasonal immigrants skills in fishing industry and waterway transportation, and then some have become to settle here. On 24th August 2013, the Ayeyarwady Bridge (*Yadanathein -kha*), connected with Singu, Mandalay Region, was inaugurated and thus transportation between east and west regions of the Ayeyarwady River has become more convenient and can be made in all seasons without any hesitation and difficulty. It will certainly affect on the development of Kyaukmyaung into an urban area from headquarter of the sub-township. These transportation links of Shwebo-Kyaukmyaung road and Ayeyarwady Bridge (*Yadanatheinga*) will be promoted to the development of socio-economy in the eastern rain-fed area of Shwebo Township. The Ayeyarwady River passes through for about 27 miles along the eastern boundary of the sub-township. It is not beneficial for irrigation system but it is important for waterways. Kyaukmyaung is composed of (4) quarters that include Kyaukmyaung, Yedaw, Nwenyein, Letywe and Hnawbin villages. Kyaukmyaung has an elongated shape. It has an area of 19.46 square miles or 16839.6 acres. The total population was 10,703 persons, of which 5056 are male and 5647 are female in 2014. Its density was 550 persons per square mile in 2014.

Aim and Objectives

The aim of this paper is to study the population distribution and density in urban areas of Shwebo Township, and how population distribution patterns change according to the physical environment of studied area The Objectives are:

- To study variation of population distribution and density in urban areas of Shwebo Township.
- To clarify whether the location and area affect on population distribution and density in urban areas of Shwebo Township.
- To clarify whether the cottage industry especially the glaze industry affects on population density of the Kyaukmyaung.
- To analyze the relationship of area and population distribution.

Data Base and Methods

Both secondary and primary data are collected from the various Government offices and by interviewing with the local people. To classify the level of distribution and density of population in the study area, numbers of variables are applied. Coefficient of variation is calculated to show the regional disparity. The current population data for the year 2014 are collected from Village Tract Peace and Development Councils, Immigration and National Registration Departments of Shwebo Township. Then the collected data are processed and transformed into necessary and useful data by

using computer. These processed data are analyzed by means of graphical methods, quantitative methods, and regression method.

Population Distribution and Density in Shwebo Town

Shwebo is composed of (10) quarters and (50) wards. Shwebo has an area of (3012) acres or (4.69) square miles. Its population was 69,036 persons in 2014, of which 32,425 are male and 36,611 are female. Its population density was 14719.83 persons per square mile in 2014.

In Shwebo, Quarter (1) is composed of Butaka, Butahka and Pyinze North wards, which has an area of 407 acres or 0.63 square mile. It has a population of 8,915 in 2014. Quarter (2) is composed of Pyinze South, Dobedan and Kyonedawtwin wards, which has an area of 221 acres or 0.34 square mile. It has a population of 5677 persons in 2014. Quarter (3) is composed of Bogone, Sargyingone, Eaindaryart, Thetkedan and Zaydan wards, which has an area of 285 acres or 0.45 square mile. It has a population of 4067 persons. Quarter (4) is composed of Anaukze, Kyidawsu, Mayoegon and Aungzeya wards, which has an area of 284 acres or 0.44 square mile. It has a population of 7446 persons. Quarter (5) is composed of Minyartkyetthit, Sinyon and Minyart wards, which has an area of 227 acres or 0.35 square mile. It has a population of 6,917 persons. Quarter (6) is composed of Thakhuttaw and Kyedainsu wards, which has an area of 196 acres or 0.31 square mile. It has a population of 4,512 persons. Quarter (7) is composed of Seikkunsu, Songone, Shansu, Myeiksu, Wetletywe, Kyigone and Chibasu wards, which has an area of 308 acres or 0.48 square mile. It has a population of 8276 persons per square mile in 2014. Quarter (8) is composed of Aungchantha, Thidagu, Pyidawtha and Wundaweain wards, which has an area of 203 acres or 0.32 square mile. It has a population of 6226 in 2014. Quarter of (9) is composed of Nemye 1 to Nemye 12 wards, which has an area of 353 acres or 0.55 square mile. It has a population of 4876 persons. Quarter (10) is composed of Thayetchan, Htudaundye, Seinphaya, Mezebinsu, Myittagan, Kyoetbingon and Khyetthit wards, which has an area of 528 acres or 0.82 square mile. It has a population of 12124 persons in 2014.

In Shwebo urban area, quarter (10) is the largest number of population and quarter (3) is the smallest number of population. The largest number of population, quarter (10) is also the largest area (528 acres or 0.82 square mile) and it can be divided into the areas of western and eastern portion by Thetkeddan Chaung (stream). The western portion of Thetkeddan Chaung (stream) was extended during the 1972-73 and composed of original villages of Mazalebingon, Minywathit, Zegaly, Nwalaygon and Htudaungye block. There are many governmental offices and apartments such as Irrigation Department, Department of Construction, and District Administration Department. During 1995 to 2000, the eastern portion of Thetkeddan Chaung (stream) was extended to an urban area at the end of the Shwebo University. The migrant population of Shwebo is very interested to dwell in this portion of Quarter (10). This portion has very suitable soil foundation of Red Brown Savanna Soil for buildings and sufficient on water supply by artesian tube wells and accessible transportation roads by the high way of Shwebo – Myitkyina. Many people were moved to the Industrial Zone and the Shwebo University environmental area. There will be more and more developed in this Quarter (10) with economically and accessibility of transportation; Shwebo – Kyaukmyaung road (17miles) after the completion of Ayeyarwady Bridge (Yadanatheinkha) connected with Singu Township, Mandalay Division.

The smallest population of Quarter (3) is also the small area (285 acres or 0.45square mile) because it includes governmental office, official residences, recreation park, guest house of the chief of the state, desuetude airfield, football field, monasteries, moats, governmental nursery school, police station, electric power generation EPC office , army, court, philanthropic youth development camp, etc.

The resulting regression equation $y = -0.0204 x + 29.741$ the determinant $R^2=0.1346$ and the correlation coefficient $r = + 0.5$ indicate that there is high degree of positive correlation between area and total population in Shwebo.

The mean population density of Shwebo is about 14719.83 persons per square mile or 22.92 persons per acre. In Shwebo, Quarter (1) which has an area of 407 acres or 0.63 square mile and its population density was 14150.79 persons per square mile in 2014. Quarter (2) which has an area of 221 acres or 0.34 square mile and its population density was 16697 persons per square mile in 2014. Quarter (3) which has an area of 285 acres or 0.45 square mile and its population density was 9037.77 persons per square mile in 2014. Quarter (4) which has an area of 284 acres or 0.44 square mile and its population density was 16922.73 persons per square mile in 2014. Quarter (5) which has an area of 227 acres or 0.35 square mile and its population density was 19762.86 persons per square mile. Quarter (6) which has an area of 196 acres or 0.31 square mile and its population density was 14554.84 persons per square mile. Quarter (7) which has an area of 308 acres or 0.48 square mile and its population density was 17241.67 persons per square mile. Quarter (8) which has an area of 203 acres or 0.32 square mile and its population density was 19456.25 persons per square mile. Quarter (9) which has an area of 353 acres or 0.55 square mile and its population density was 8865.45 persons per square mile. Quarter (10) which has an area of 528 acres or 0.82 square mile and its population density was 14785.37 persons per square mile.

The highest density of population in Shwebo urban area was Quarter (5), which has 19762.86 persons per square mile or 30.47 persons per acre. This quarter lies on the south and southeastern corner of Shwebo and it has a small area. This area includes Shwebo General Civil Hospital, special clinics and Private Hospital, and brokers' sales center of rice, pulses and oil. In Quarter (5), Minyart wards lies in the Central Business Zone in Shwebo urban area. Almost of this area is the residential area, so it is the densely populated area of Shwebo.

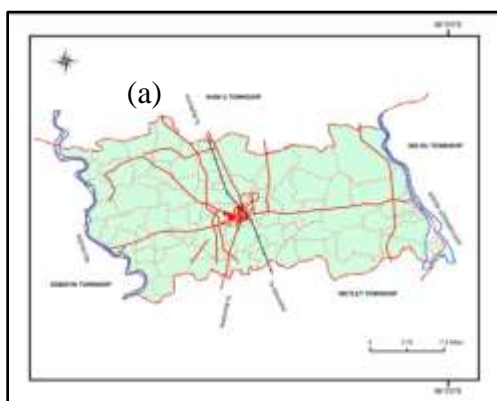


Figure (1.a) Location map of Shwebo

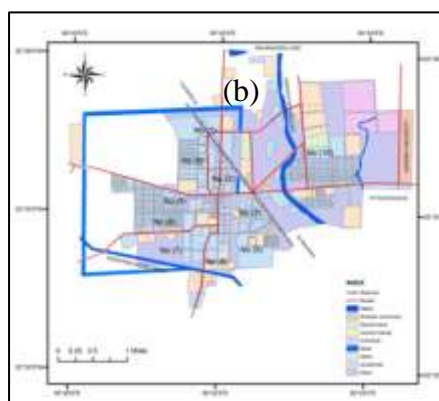


Figure (1.b) Location map of Shwebo

Source: Land Records Department, Shwebo

The lowest density of population in Shwebo urban area is Quarter (9), which has 13.81 persons per acre or 8865.46 persons per square mile. It includes Thettharpandaung block which is divided from Nemye 1 to Nemye 12 ward. It was extended in 1956 by Pyidawtha Plan. It is located on the northwestern corner of Shwebo where the least interest of dwellers due to stink and mud in raining. There are many cultivated area in the westward of this quarter. Therefore it is the sparsely populated area in Shwebo.

The resulting regression equation $y = 17.787x + 1546.1$, the determinant $R^2=0.5849$ and the correlation coefficient $R = + 0.8$ indicate that there is a very high degree of positive correlation between area and total population in Shwebo.

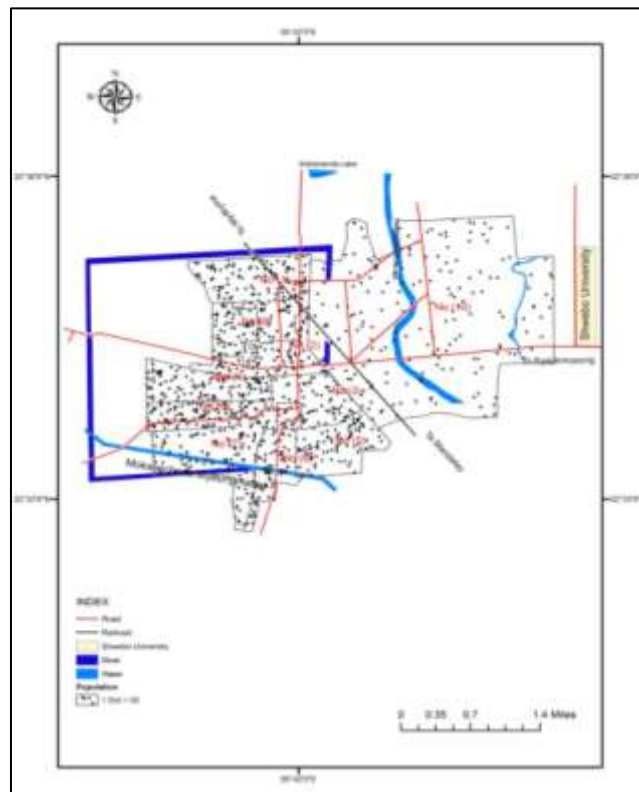


Figure (2) Population Distribution Map of Shwebo

Source: Immigration and National Registration Department, Shwebo Township

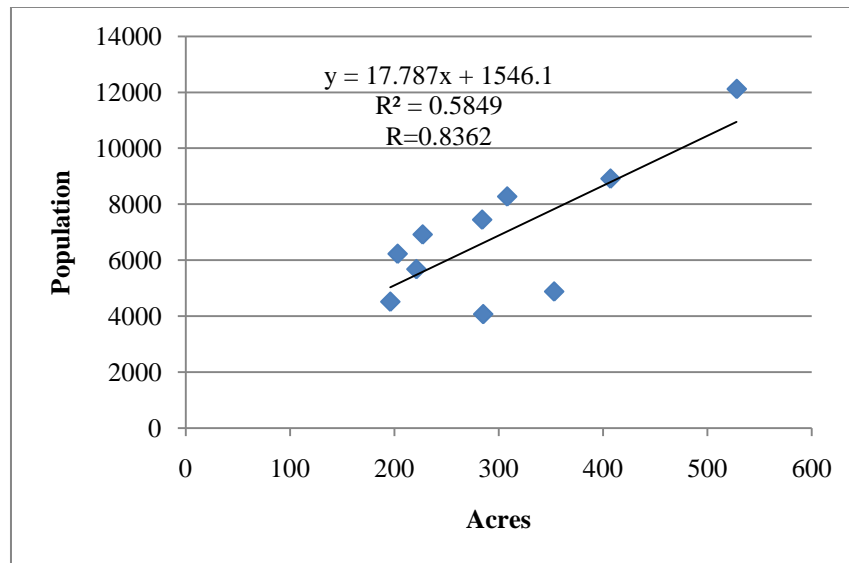
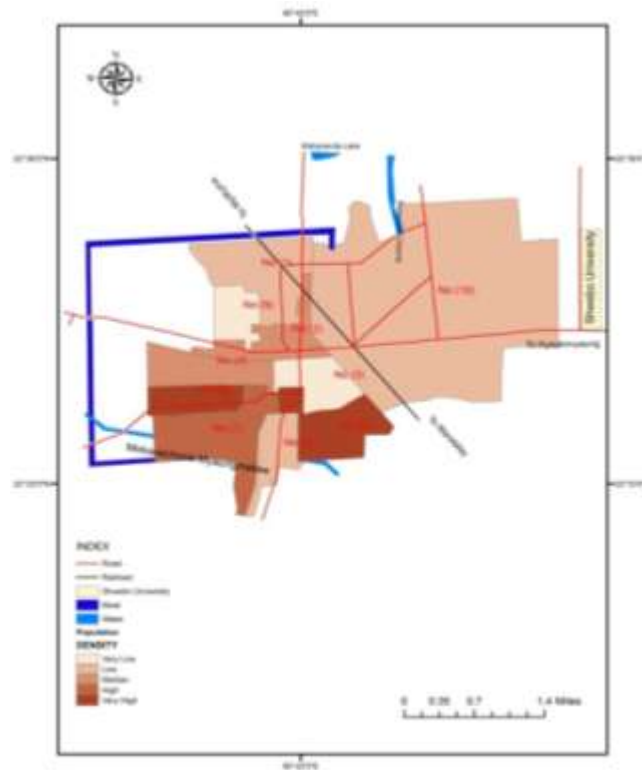


Figure (3) The Correlation between Area (Acres) and Total Population in Shwebo



Map (3) Population Density in Each Quarter of Shwebo

Source: Immigration and National Registration Department, Shwebo Township

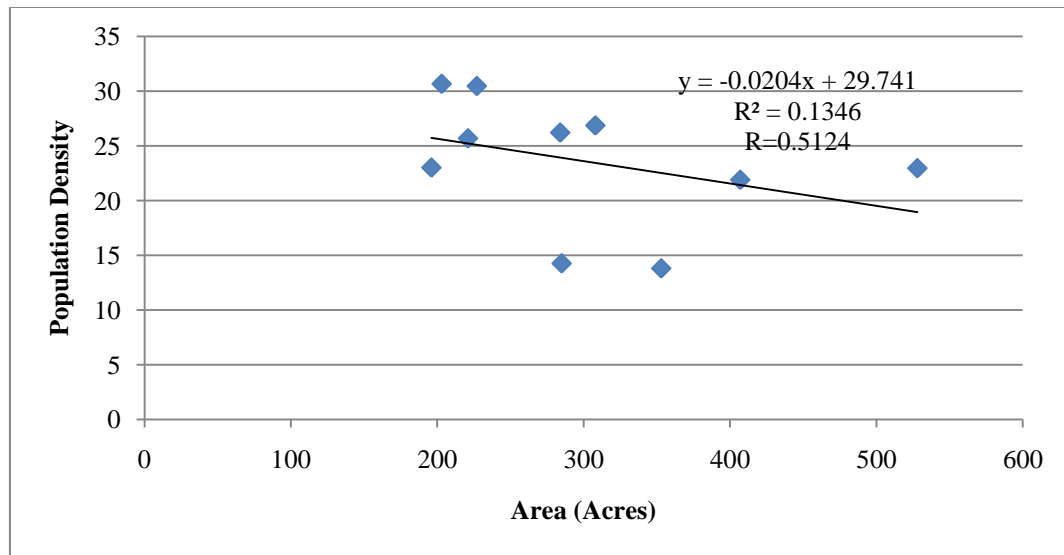


Figure (4) The Correlation between Area (Acres) and Population Density in Shwebo

Population Distribution and Density in Kyaukmyaung

Kyaukmyaung is composed of (4) quarters that including Kyaukmyaung, Yedaw, Nwenyein, Letywe and Hnawbin villages. Kyaukmyaung has an elongated shape. It has an area of 19.46 square miles or 16839.6 acres. The total population was 10,703 persons, of which 5056 are male and 5647 are female in 2014. Its density was 550 persons per square mile in 2014.

In Kyaukmyaung, Quarter (1) is composed of Yedaw village. It has an area of 2407.47 acres or 2.74 square miles. It has a population of 1926 persons in 2014. Its population density was 702.92 persons per square mile in 2014. Quarter (2) is composed of the northern part of Kyaukmyaung village, has an area of 13224.03 acres or 15.3 square miles. The total population was 2883 persons in 2014. Its population density was 188.23 persons per square mile. Quarter (3) is composed of the southern part of Kyaukmyaung village and it has an area of 1158.1 acres or 1.37 square miles. The total population was 2950 persons in 2014. Its population density was 2153.29 persons per square mile. Quarter (4) is composed of Nwenyein, Letywe and Hnawbin villages. It has an area of 50 acres or 0.05 square miles. It has a population of 2944 persons in 2014. Its population density was 58.88 persons per acre in 2014.

The largest population of quarter (3) lies in the center point and nearest to Kyaukmyaung port and market. Most people that live in this area are tradesman and vendors. They are mainly depending on purchasers upstream of the Ayeyarwady River. The smallest population of quarter (1) includes forest and cemetery and institutional land. It is nearest to Ma-au Reserved Forest. The resulting regression equation $y = 0.0114x + 2627.8$, the determinant $R^2 = 0.192$ and the correlation coefficient $R = +0.3$ indicate that there is a low degree of positive correlation between area and total population in Kyaukmyaung.

Quarter (4) was the highest density of population in Kyaukmyaung. It is very small area with 50 acres or 0.05 square mile. This area is composed of Nwenyein, Letywe and Hnawbin villages. Nwenyein is home to the largest scale glaze factories in upper Myanmar. The reason for dense

population was due to the well-known glazed earthen pottery works with very narrow passage of land along the Ayeyarwady and water transportation. It is one of the non-agro based economies in this area. According to the field observation, the industries of glazed earthen pottery are highly absorb the labour force and enough income by skilled labour and continuous trained and practice to people especially in young aged labourers with reliable salary rate proposals for future in skilled labour. Nwneyein employs people to do everything from harvesting the river bed to in firewood for the firing process. The more decorative and smaller types of pottery are thrown by women. Quarter (1) was the smallest population and the lowest population density in Kyaukmyaung urban area. The reason for sparse population was due to the most area was forest, cemetery and institutional land. This area is also the mining sites of Dark Brown and Yellow Brown soil for raw materials of glazed pottery industry. The resulting regression equation $y = 49.318x + 1015.8$, the determinant $R^2 = 0.131$ and the correlation coefficient $R = +0.5$ indicate that there is a high degree of positive correlation between area and total population density in Kyaukmyaung.

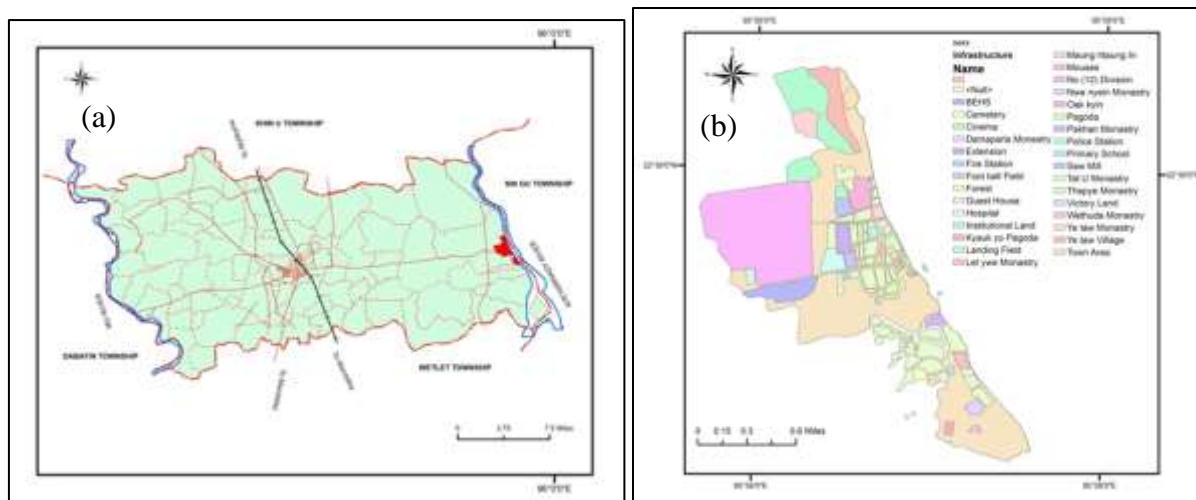


Figure (4.a and b) Location Map of Kyaukmyaung

Source: Immigration and National Registration Department, Shwebo Township

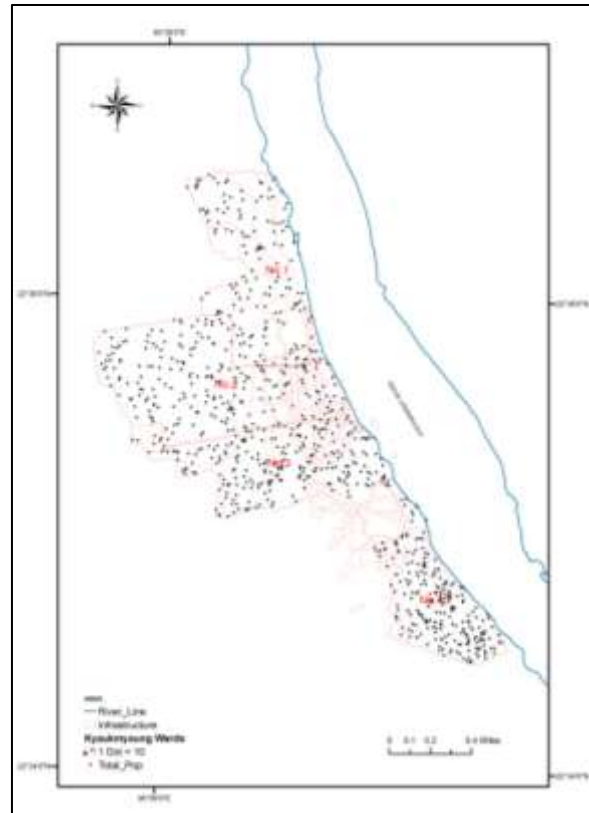


Figure (5) Distribution Map of Kyaukmyaung in 2014

Source: Immigration and National Registration Department, Shwebo Township

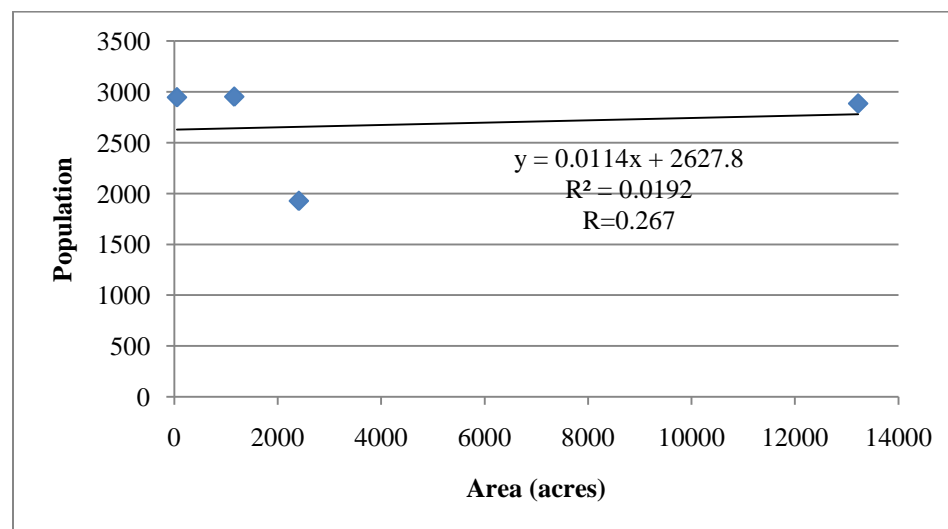


Figure (6) The Correlation between Area and Total Population in Kyaukmyaung

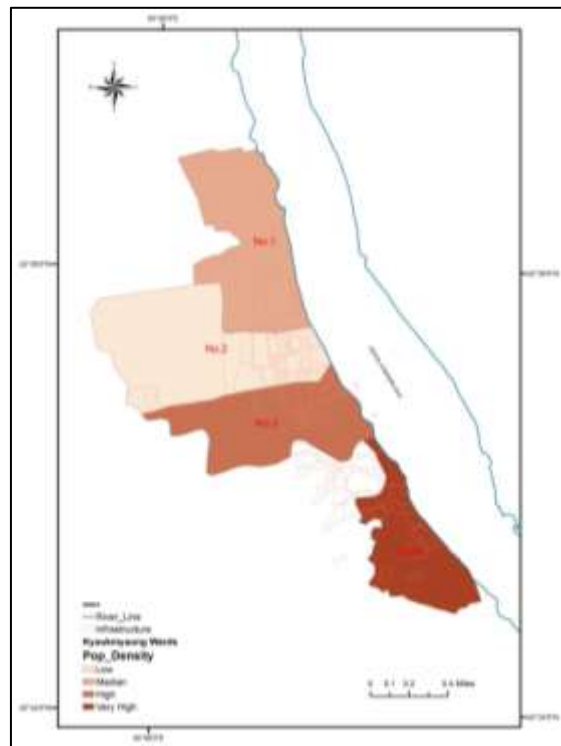


Figure (6) Population Density in Each Quarter of Kyaukmyaung (2014)

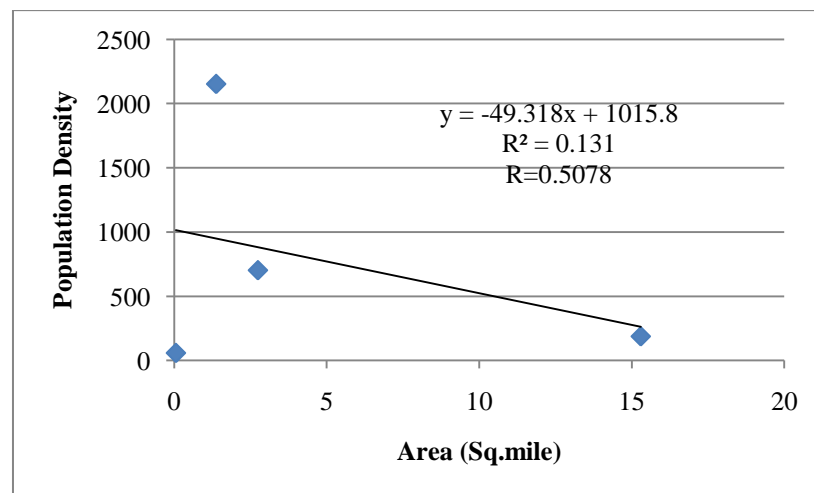


Figure (7) The Correlation between Area and Population Density in Kyaukmyaung

Conclusion

In Shwebo, the largest populated area can be found out with extended urban area, sufficient of water supply by artesian tube wells and accessible transportation roads, the Industrial Zone and Shwebo University environmental area. This area will be more and more developed in the economy and population of Shwebo. The smallest populated area can be found that it includes governmental office, official residences, recreation park, guest house of the chief of the state, desuetude airfield, football field, monasteries, moats, governmental nursery school, police station, electric power generation station, EPC office, army, court, philanthropic youth development camp, etc. The densely populated area lies on the south and southeastern corner of Shwebo Town and it has a small area. Almost of this area is the residential area, so it is the densely populated area of Shwebo. This area includes Shwebo General Civil Hospital, special clinics and Private Hospital, and broker's sales center of rice, pulses and oil. The sparsely populated area can be found on the northwestern corner of Shwebo where the least interest of dwellers due to stank and muddy in raining. There are many cultivated area in the westward of this quarter. Therefore it is the sparsely populated area in Shwebo. In Kyaukmyaung, the largest populated area can be found in the center urban area and it lies nearest to the port and the market. Most people who live in this area are tradesmen and vendors. They are mainly depending on purchasers upstream and downstream of the Ayeyarwady River. The smallest populated area can be found the areas of forest, cemetery and institutional land. The densely populated area of Kyaukmyaung is very small with 50 acres or 0.05 square mile and the largest scale glaze factories in the upper Myanmar. The industries of glazed earthen pottery highly absorb the labour force and give enough income to skilled labour and continuous training and practice to people. The sparsely populated area includes a forest, a cemetery and an institutional land. This area is also the mining sites of dark brown and yellow brown soil for raw materials of glazed pottery industry. There is a very high degree of positive correlation between area and total population of the urban areas of Shwebo.

Suggestion and Future Prospect

The distribution and density of population in urban areas of Shwebo Township vary distinctly with the effect of the socio-economic conditions associated with the physical features. Largely and densely population are caused by the promotion of local economy, education, health, job opportunities, security and transportation. Shwebo is the main producer of rice, peas and beans, and sesamum, especially in Shwebo Begyar, Shwebo Manaw, Pigeon pea and Green gram. These are sold at Mandalay, Yangon and exported to other countries such as China, India, etc. Shwebo is connected with north to Kachin State, west to Depayin Township, east to Singu, Mogoke, Mandalay Region, south to Mandalay and Yangon, southwest to Monywa, Sagaing Region and the whole of Myanmar by railway, motorway and waterway. Therefore there are also the most famous products of Glazed Pottery and Seikkun Longyis. Seikkun Longyis and Glazed Pottery are distributed to the whole country. Kyaukmyaung is the transit area, and so distributes variety of pulses, treacle, kipper, and salt fish, etc. that are produced from Katha, Htegyint,

Tagaung, Kyanyet, etc, transported by waterway. So Kyaukmyaung is very popular. It will certainly affect the development of Kyaukmyaung to become an urban area with Headquarters of the sub-township. Ayeyarwady Bridge (Yadanatheinga) has caused a better transportation and an economic development which continue to develop the socio-economy in this area. Then urban area of Shwebo Township will continue to more migrate by rural population from Shwebo Township and other areas. Therefore urban areas of Shwebo Township will be more and more populous area in future.

Acknowledgement

I would like to express my special thanks to Dr. Myint Swe, Rector, Taunggye Degree College for prompting to write this research paper. I have referred in my reference sources for which I owe their indebtedness to the original authors and the research.

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Effective Urban Landuse Pattern as a Key Factor for Potential Development of Socio-economic Activities: A Case Study of Anauk Myodwin Ward, in Dawei Twon , Tanintharyi Region

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Abstract

This paper describes “Effective Urban Landuse Pattern as a key factor for potential development of socio-economic activities: A Case Study of Anauk Myodwin Ward, in Dawei Twon , Tanintharyi Region”. The study emphasized of Socio-Economic activities effect on the urban landuse investigated in Anauk Myodwin Ward. Most of the people in this ward are Buddhists. They carried out different types of landuse patterns, the number of houses, social and economic factors, commercial land, building material, typical house type and plan. As a whole ward, the distribution of landuse patterns may be multiple distributions. The utilization of landuse pattern that the future generations will be benefited from them. The socio-economic activities are achieved on the urban landuse pattern, the fishing and merchants, sellers and businessmen, government employees, infrastructures facilities and miscellaneous on the urban landuse pattern for their living, that which the socio-economic development activities may occur toward the extension on both the urban land. In the recent period, some people migrate to neighboring for their economic activities on the locational advantages. The findings of the research are based on survey account the urban ward. It is found that there will be good at socio-economic potential development on the urban landuse pattern for the Anauk Myodwin Ward, Dawei Town, Tanintharyi Region.

Key words: effective urban landuse, business factors, socio-economic factors, potential development factors

Introduction

The purpose of the practical survey is to know the geographical urban landuse and socio-economic activities systematically. This paper provides an analysis of socio-economic activities on urban landuse pattern in the Anauk Myodwin Ward. The following its designation as in the Anauk Myodwin Ward. The former is divided into two settlement areas such as Anauk Ward and Myodwin Ward. This is located in south-western part of Dawei Township as an ancient town. It was rebounded in the Myanmar year 1116, the waxing (13) of Taboung Month(1755 A.D) by Myosa U Ne Hla, Min Ne Hla who constructed strongly the town with the brick walls. The original settlement was established at Thagara(Myo-houng Village in Launglone Township) in Myanmar year 113. The original name of the town was called “Tharyawadyand A.D ”. In 1824, after British had occupied. Dawei and A.D Maingay’s report, the first Tanintharyi Division Commissioner expressed thatwards and population had been declared under the town’s Action data of Dawei from the period 1824-26 up to 1842-43. Anauk Myodwin Ward had established within Dawei Town 1824 data, the population and since 1824. According to the dada record, in Anauk Ward were 773 persons and 114 houses and in Myodwin Ward were 422 persons and 59 houses.

Fifteen Wards have been declared under the town’s Act in 1972. Anauk Myodwin Ward was combined with Anauk and Myodwin Wards. This paper provides the information concerned

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with the improvement of transportation in the urban area, very good future prospect for social and economic development. This development prospect has materialized with the construction of border trade of economic development recently. These socio- economic development on the urban landuse pattern are related to each other. Since, the government designated to introduce the systems of export product of fishing economy, private fishing economic activities, formal and informal water way transportation services, other businesses, and some social infrastructures were also developed. Especially, formal and informal water way transportation services, economic and communication developments are distinguished on the urban area as a socio-economic development in Anauk Myodwin Ward. It is chosen to make a research from the geographical point of view. The sources of all the socio-economic activities in this research paper were mainly based mainly on available primary data, formal & informal interviews, expert interviews and field observations. Since the study area is not widespread, wide socio-economic variables and data for 2017 could be obtained for them. Some of the maps are used from Land Records Department, Dawei Township. Primary data (variable of socio-economic data) was used to illustrate the socio-economic activities on the urban landuse and the results are illustrated as numerical values with tables, figures, plates, maps and diagrams.

Research Background and Design

In developing countries, socio-economic factors and ecosystems are generally created by its physical environment and cultural background. Socio-economic and ecosystem conditions are also very important for sustainable rural and urban development. Thus, this paper analyzes socio-economic activities and behavior on the types of urban landuse pattern. Concepts of socio-economic activities played on urban landuse pattern that general research frame mentioned in the study area is used as guidelines based on some scholars. They are; Jeffrey C. Bridger and A.E. Luloff. (1999): Toward an international approach to sustainable community development from the socio- economic view. Osuala, E.C (199), Introduction to Research Methodology. Africana Publishers Ltd, Ibadan. This general research framework is as follow;

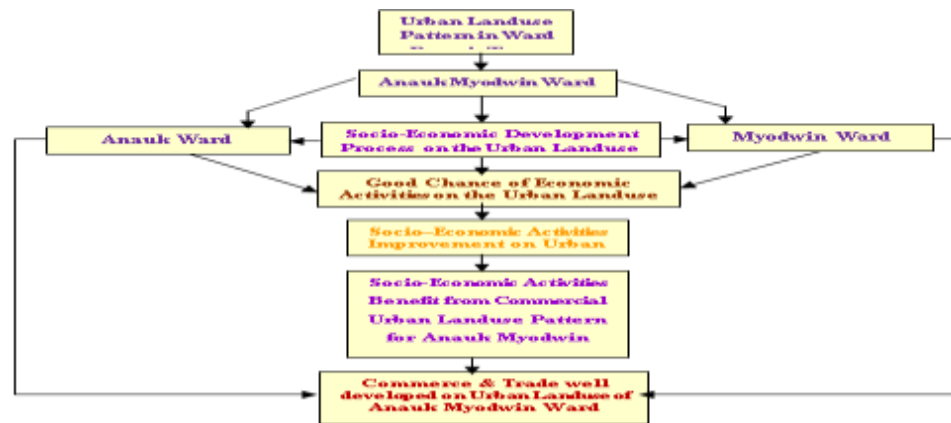


Figure (1) General Research Framework in Study Area

Study Area

Dawei Town is situated in the northern part of Tanintharyi Region. It is composed of fifteen Myoma Wards. It has an area of 10.03 square miles (6421 acres). The study area of Anauk Myodwin Ward is one of the fifteen Myoma Wards of Dawei Town. It is located in the central part of Dawei Town. Anauk Myodwin ward is located between 14° 4' 16 "and 14 °4' 28 "North Latitudes and 98 °11' 34" and 98 °11 '50" East Longitudes. The total area of Anauk Myodwin ward is 0.007 square miles (42.2 acres). Its area is 0.697% of total town area. It is rectangular shape. It is bounded on the north by Ouloke Ward, on the east by Peinetaw Ward, on the south by Zayit ward and the west by Talainhtein Ward.

Aims and Objectives

- To know about more the socio-economic conditions of Anauk Myodwin
- To examine the social and economic pattern of living of the native people.
- To analyze the effective urban land use of a particular area
- To access the physical, social and economic factors effective on the residential Land use patterns for human survival in the area

The future prospect of the socio- economic effects on the urban Land use that toward the development of Anauk Myodwin Ward in Dawei Township.

Source of Data and Methodology

Data Collection To identify them, detailed primary data such as locational choice factors data are collected through the intensive field surveys and structured & expert interviews conducted in April 2017. Secondary data such as Base map & Secondary data collected from the relative office and drawing maps, diagrams, reference books and literature reviews, graphs and taking photograph are used for explanation. Primary data collected such as socio-economic activities on the urban land use pattern by field survey .Which were conducted for verification of the acquired facts. In addition, topographic maps (one inch) and field survey are used as hardware, and then Arc GIS 10.1 are used as software to cartographic maps.

In this research paper, Factors controlling the causes of socio-economic activities on the urban land use through semi-structured interview method, qualitative and quantitative methods, and GIS technique are used. Social and economic variables are based on the urban land use. To identify that to find out the processes that generate on the land use pattern of Anauk Myodwin Ward based on the available information through the visual field observations. Then semi-structured interviews were conducted by systematic sampling method. That in terms of socio-economic activities effects on the land use pattern of Anauk Myodwin Ward to income generating activities on the settlement areas. Those were identified for detailed fieldwork. Because the spatial spread of the urban area was not wide, variations in socio- economic activities on the urban land use could be counted in more detail, which provides details of the urban land utilization pattern of the nature in given environment.

Results and Findings

Physical Factors of Anauk Myodwin Ward

Dawei Town is situated in the northern part of Tanintharyi Region. It is composed of fifteen Myoma Wards. It has an area of 10.03 square miles (6421 acres). The study area of Anauk Myodwin

Ward is one of the fifteen Myoma Wards of Dawei Town. The total area of Anauk Myodwin ward is 0.007 square miles (42.2 acres). It's area is 0.697% of total town area. The shape of the study area is rectangular shape in figure (1.a, 1.b, 1.c, 1.d). It is situated on the eastern bank of Dawei River and the whole town is undulation feature. But its landscape is low and flat. The general elevation of this area is 50 feet above sea level. Dawei River flows from north to south and enters into the Andaman Sea. It is about one hundred miles long. There are some creeks within Dawei Town. They are tidal creeks. Climate is an important factor which influence on economic activities and human settlement. Dawei Town receives the type of the Tropical Monsoon Climate (Am). The types of natural vegetation depend on the climate, soil and topographic features. Mangrove forest types are commonly seen along the eastern bank of Dawei River. The lower mixed deciduous types are found on the northern part of Dawei Town. The bed rock is mostly grey soil. Alluvium soil is found in the bank of Dawei River and its tributaries. Mountain late rite soils and lateritic soils are found at higher elevations in the region (1.e).



Figure (1.a.) Location of Tanintharyi Region in Myanmar

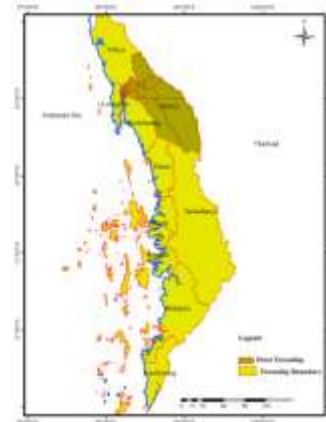


Figure (1.b.) Location of Dawei Town in Tanintharyi Region



Figure (1.c & d) Location of Anauk Myodwin Ward, Figure (1.e) Relief Map of Dawei Town

Source: STRM DEM 90m and UTM Map, 2004

Socio - Economic Factors of Anauk Myodwin Ward

Dawei was an ancient town. It was rebounded in the Myanmar year 1116, the waxing (13) of Taboung Month(1755 A.D) by Myosa U Ne Hla, Min Ne Hla was constructed strongly the town with the brick walls. The original settlement was established at Thagara(Myo-houng Village in Launglone Township) in Myanmar year 113.The original name of the town was called “Tharyawadyand A.D ”. In 1824, British occupied. Dawei and A.D. Maingay’s report, the first Tanintharyi Division Commissioner had expressed wards and population been declared as know under the town’s Action data of Dawei Town from 1824-26 up to 1842-43. Anauk Myodwin Ward had established within Dawei Town 1824 data, the population and town since the year of 1824. According to the houses of Anauk Ward were 773 persons and 114 houses and Myodwin Ward were 422 persons and 59 houses. Fifteen Wards have been declared as know under the town’s Act in 1972. Anauk Myodwin Ward was combined with Anauk and Myodwin Wards.

Population growth is an important factor in socio-economic activities, the number of residents increased from 2002 to 2011 and but the population is little decreased in 2017. Anauk Myodwin ward is a moderately population size ward in Dawei Twonship. It can note that the population has changed. The population growth is mainly due to migration increase from rural to urban area. In 2000, total population of Myodwin ward was 2089 persons. In 2002, total population was decreased 1687 persons and the total population has increased to 2241 in 2011. In 2017, the total population is 2237 persons. The population was little decreased in 2017. In the ward, total number of female is 1244 persons and the male is 993 persons. There were about 409 houses and 441 households are in the ward. Although, some year the population has decreased, the population of Anauk Myodwin ward has always been increased year by year. Most of the inhabitants are Bamar(Dawei indigenous). The other indigenous races are Kayins, Mons Rakhines and others. Foreigners, Indians and Chinese can also be found in this ward. There are four Chinese Temples, one Christian Church, one Islamic Mosque, one Damaryone and one Buddhism Association. The population growth is good sign for future economic development of the ward.

The government is implementing education promotion programmes. In Anauk Myodwin Ward, there are two Basic Education Primary Schools. They are one Basic Education Primary School in Anauk Ward, It was opened in 1950 and another one Basic Education Primary School was in Myodwin Ward, it was opened in 1928. It is suitable condition for effecting of basic education status in Anauk Myodwin ward. Majorities of the people in this ward are merchants, sellers and businessmen. Some engages government employees, miscellaneous workers and farm labours. There have one Regional Health Care Department and four Private Clinics in Anauk Myodwin ward. There have no pipe -line system. But there have sufficient for water supply in the study area, because of almost every houses have one surface well or artesian well in this ward. The deep water of artesian wells is about 50-60 feet deep. In the residents within the town area, every household has nearly one well each, and can utilize the well freely. Accordingly, fresh water supply from this well becomes available throughout the year and electricity for the residents supply from local and regional own private generator in the Anauk Myodwin ward.





Plates (1, 2, 3, 4,5,6): Field Work on Socio - Economic Activities in Anauk Myodwin Ward

Source: Actual Field Observation in April, 2017

Socio-Economic Activities Effect on Urban Landuse Pattern of Anauk Myodwin Ward, Dawei Town

Types of Landuse

The general urban landuse pattern of Anauk Myodwin ward, Dawei Town can be classified into eight categories as follows: (1)Residential Landuse , (2)Commercial Landuse, (3)Industrial Landuse, (4) Landused for services, Institutional Landuse (Landuse for Public and Government Department), (6)Recreational Landuse,(7)Transportational Landuse, (8) Unclassified Landuse and Land under Water Bodies.

1. Residential Landuse

Among the urban Landuse types, residential landuse is the most important and determinant factor of the urban development of the town. The Anauk Myodwin ward is (42.2acres).The number of land plots allotted for residential use is (402) plots. At present, the ward has only 409 houses with 441 household. Building can be found mixed with other landuse. Most of the people living in this area use their residences and commercial purposes. There are 2237 people in this ward in 2017. Most of the buildings within this ward good condition and some are fairly moderate condition. Good conditions of houses are found on the Arzarni Road, Bogyoke Road, Neik Ban Road, Dawei-Ye Road, U Kyaw Yin Street, Myodwin Street and Duwon Street. Types of houses high buildings are one, two, three and four storey with made of brick and corrugated iron-roof. Some are poured concrete. These houses are more modernized than the other wards. In which roads, most of the buildings are used for upper floor is residential and ground floor for commercial landuse(retail and wholesale business and services). Fairly moderate conditions houses are found behind the houses on the motor roads and one-two storey with made of brick and wood and corrugated iron roof. This reflects the high socio-economic status of the inhabitants. Residential landuse is about (47.07) percent of the total landuse type in Anauk Myodwin Ward. Therefore, many houses are large double storied houses. Since 1988, the houses, their overall versions, house types, designs, structures and economic activities had changed together with the town's urban development trends, especially in the south-west central part of urban area of Dawei Town. It can be said that, “the residents in there are more chanced than other urban area for not only freely use selling and buying activities but also without time consuming and there is the chance of combined use for residential and commercial landuse area”. Therefore, there is equally effected for the residents with potential development of socio-economic activities on the urban landuse in Anauk Myodwin Ward.

2. Commercial Landuse

Commercial activities and their associated locational sites cannot be carefully separated in the nearby residential facilities .The commercial Landuse and serviceable (including banks, professional,

recreational services) etc, are found among the residential areas. The commercial landuse of the study area include all the economic activities (retail and wholesale business, . general stores, retail shop, textile and clothing, lottery, fancy shop and foodstall, Cold and snack bars, and restaurants, tea shops, cold drink shops, betal shops, dried fish and prawn collecting and distributing centres , warehouse and their controlling office are clustered and services are located along the main road such as near the Mingalar market, along the Arzarni Road, Bogyoke Road, Neik Ban Road and Dawei –Ye Road, along U Kyaw Yin Street and Myodwin Streets .Hotels, motor cycle repairing services, bicycle workshop and beauty parlors , trading services and tourism services, clinics, and banks ,these services can be found along the main roads. along the Arzarni Road, Bogyoke Road, Neik Ban Road and Dawei –Ye Road, along U Kyaw Yin Street and Myodwin Streets are mostly found. Indigenous medicine, tailoring services and other services are found in these ward.Small shops are scattered everywhere within the ward. The most shop is attached to house in this area. Commercial landuse is about (17.74%) percent of the total Landuse type.

From the above facts, “there is the chance of combined use for residential and commercial landuse area. There is more created for activities of economic development and income level improvement from the multipurpose economic functions in there. Hence, they can develop these economic activities within a short time”. Therefore, there is potential for development of economic activities in near future on the urban landuse for the residents.

3. Industrial Landuse

There are the smallest one in the whole area. There are three confectionaries and two presses. Three Confectionaries are found on the Arzarni Road, Anauk Ward and Bogyoke Road. One press on the Myodwin Street and another press are found on the Bahosi Street. There are small scale industries landuse is about (0.82%) percent of the total landuse type. The rest of small scale industrial works scatter all over the residential areas of the town wherever favorable conditions occur. It can be said that, “small scale industrial landuse type can be found in there. But, if the residents are high level income from potential development urban landuse, which may be build and create the largest mill and factory from informal site with formal way toward economic development prevent from the government site for industrial landuse area in there”.

4. Landused for Services

Landused for services include financial institutions(banking, medicine services and indigenous, hotels, insurance, pawn-shops), professional services(western and indigenous medicine services by legal professionals, training schools, courses, tuitions) , skilled services (beauty parlour, beauty salon, photo studio, tailoring services, dhobi, dry –cleaning), repairs (work-shops, bicycle repairs, watch repairs), shops catering for lending services (books, household furniture and crockery) , recreational services (sport stadiums, cinema, theatre, offices for services, lodgings and day nurseries).KBZ Bank, Mya Seine Hall, Za Byuris Wedding Hall, ALC Computer Training and Language Centre, Aungmingalar Cinema , Golden Guest Hotel and Garden Guest-house , Personal business and professional services are found mainly along Arzarni Road, Bogyoke Road, Myodwin Street, Dawei-Ye Road, U Lunn Baw Street, U Kyaw Yin Street and Anauk Street. Most of the services are attached to house in this area. Landuse for services is about (7.91%) percent of the total landuse type. From the above facts, “these services can be found along the main roads. There will be development potential for knowledge awareness from regarding service functions to the residents and low amount expenditure that will be targets for the residents” in there. “These conditions will also be improved to enjoy the benefits of using both economic and social activities collectively then the economic rates will change, and subsequently will be effected by economic multiplier and warehouse functions will take place” within area.

5. Institutional Landuse (Landused for Public and Government Departments)

In Anauk Myodwin Ward include School, Hospital, Government Office, Police Compound, Religious Building and Recreation Area. Public and Government Departments involve such as Head of Education office(Tanintharyi Region) and Schools, Municipal Office, Department of Information and Public Relationship, Police Staff Avenue, Myanmar Maternal and Child elfare Association Office, Fire Fighting association of Ward, Women's affair Office, Dhammaryone, Islamaic Mosque and Catholic Church.And then two Basic Education Primary Schools. Basic Education Primary Schools is situated on Anauk Street, in the Anauk Ward and another one is located on U Kyaw Yin Street in the Myodwin Ward. Head of Education office (Tanintharyi Region), Municipal Office, Buddha Tharthana Nodegaha Association are found along the Dawei- Ye Road. Department of Information and Public Relationship and Police Staff Avenue are located on the Arzarni Road. Myanmar Maternal and Child Welfare Association Office, Fire Fighting Association of Ward and Women's Affair Office are situated on the U Lunn Baw Street. And then, Ward Administrative Office is found Anauk Street.

The various religious buildings are found significantly within in the study area. There are four Chinese Temple. Of these, three Temples are located on the Neik Ban Road and the rest is found on the Myodwin Street. One Dhammaryone is located on the Anauk Street. One Islamic Mosque is found on the corner of Neik Ban Road and U Kyaw Yin Street. Catholic Church Compoundis found on the U Kyaw Yin Street. Landuse for Public and Government Department is about (10.19%) percent of the total landuse type. These are clustered on the main road and secondary road. There is more accessible than other urban landuse area. It can be said that "the residents can be used easily on social factors with the economic development and social infrastructure of ward also improved", that are also supported by the government. "This development process (social infrastructures) is greatly helped for the development potential of economic activities to the most of the residents is living in there". Which are more accessible or can exploit the numerous social infrastructures than another urban area? It can be check that, if it need for trace with the future study. But these social infrastructures can be used by another urban resident to a smaller extent. "It will benefit both social and economic activities within the ward from institutional urban landuse, there is need to maintain and urban sustainability".

6. Recreational Landuse

Recreational Landuse include Cinema, Video Halls, Parks, Play-Ground and Theatre. There are one cinema (Aungmingalar Cinema) is located on Bogyoke Road . One park is located at the corner of Arzarni Road and Dawei-Ye Road in this ward. This landuse type is about (1.54%) percent of the total landuse type. From the above result, the settlement can develop with these social and economic activities within a short time, these conditions will also be improved to recreations patterns. Hence, settlement in this area could enjoy the benefits of using both economic and social activities collectively then recreation functions will take place from social factors.

If the recreation patterns can be created from different sources and different places of socio-economic activities, in the Anauk Myodwin Ward, it will become good more conditions of recreational urban landuse pattern in the near future. The economic and social activities include a wide range of processes, which are linked to the recreation that take places. These help to produce wealth for people and maintain for them a quality of life. Its activities are the most important for people because they provide social and economic conditions and lead to and opportunities and sustainability in each activity for their living. As a result, quality of life will be improved with the recreational landuse.

7. Transportational Landuse

The major transportation system of Anauk Myodwin Ward is road. There are five main roads and nine streets. The Arzarni Road, Bogyoke Road, Neik Ban Road, Dawei-Ye Road and U Kyaw Yin Street is the important main roads. There are Anauk Street, Myodwin Street, Bahosi Street, Duwon Street, A lei Street, U Lun Baw Street, Ye- Kyaw Street, Zawgyi Street and U Zoe Street. This landuse type is about (14.73%) percent of the total landuse type. Since after 1988, the transportation is good with the socio economic development can be found in Dawei Town. The possession of transportation facilities are varied in the study area. Some of these not only use as a transporter but also as income generators. The use different types of transportation facilities are for different purposes. Bicycles, Toke Toke car, trucks motorcycles and motorboats (ferry and private) are major transportation facilities for the study area. However, motorcycles and motorboats are used as their major transport facilities. Some people can now buy motorcycles and motorboats because of their good income. In addition, nearly all residents from settlement area own one motorcycle and some residents own more than one. Thus, although it is impossible the relative wealth of residents in Anauk Myodwin Ward is clear than other urban areas. From the above facts, “the residents in there are more accessibility for transportational landuse from the chance of high level income in socio-economic activities. There is the residents are used better off on transformational landuse than the residents in another urban ward” as a result within the study area.

8. Unclassified Landuse and Land Under Water Bodies

Unclassified Landuse and Land under Water Bodies is not seen in this area. Unused landuse consists of the land without buildings. Unused landuse is about (0%) percent of the total landuse type. In recent period, as regards unclassified land, there is vocational land that is no use for arable landuse, but there is potentially used for residential area or industrial area or cultivated area or commercial area and others in there. This is mean “for residential area if increasing amount of population within the study area or Dawei Township? How can solve in there? for the (0%) percent of the total unclassified land use from the geographical point of view to the study area, It can be need to check and to trace for the future plan from the government”.

Codes for Mapping Urban Landuse

The urban land use of Anauk Myodwin Ward is classified as follow to table.

Table (1) Plots of Land use for Anauk Myodwin Ward (2017)

No	Land use Type	plots	Mini(sq-m)	Max(sq-m)	Average	Total (sq-m)
1	Residential Landuse	402	36.1	1010.5	201.04	80818.4
2	Commercial Land use	128	29.6	5184.5	253.76	30451.7
3	Transportation Land use	64	-	-	-	-
4	Land use for Public and Government Department	12	125.7	6560.6	1457.67	17492
5	Land use for services	64	35.2	922.4	212.31	13588
6	Recreational Landuse	3	487.8	1317.6	884.03	2625.1
7	Industrial Land use	7	100.1	387.1	200.07	1400.5
8	Unclassified Landuse	0	0	0	0	0
Total						171688.5

Source: Field Survey in April, (2017)

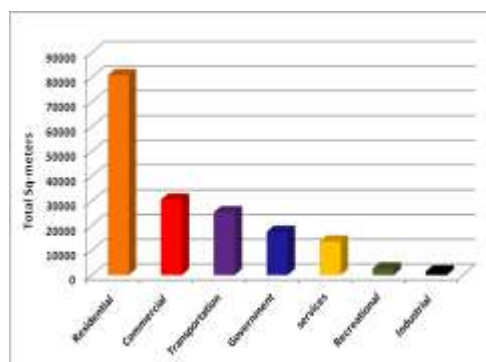


Figure (2) Urban Landuse Type in 2017

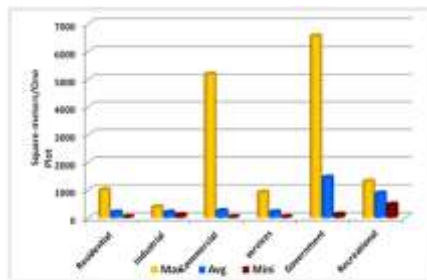


Figure (3) Urban Landuse Area in 2017

Source Based On Table (1)

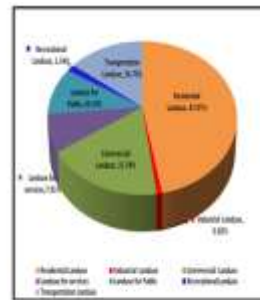


Figure (4) Percentage of Landuse for Anauk Myodwin Ward (2017)

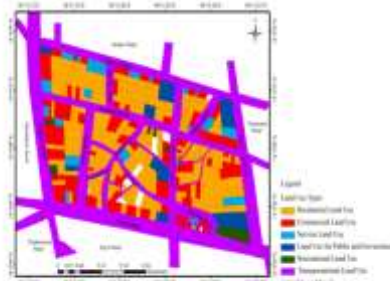


Figure (5) Land Use Types of Anauk Myodwin Ward, Total Area=42.4acres (171688.5 Sq-m)

Source: Draw based on Field Survey and Township Administration Department, Dawei Township

Findings and Discussions

Dawei Town is situated in the northern part of Tanintharyi Region. It is composed of fifteen Myoma Wards. It has an area of 10.03 square miles (6421 acres). It is located in the central part of Dawei Town. The total area of Anauk Myodwin ward is 0.007 square miles (42.2 acres). There are four main roads and ten streets. In the study area, also comprises part of Mingalar Market area. So, it is always crowded with not only people but also the shops. Almost all of these shops are attached to resident house. Some house shops begin as business activities are on the ground floors of the apartment flat. Where there were 249 opened various types of retail shops. Especially, Ar zarni road, Neik ban road, Bogyoke road and U Kyaw Yin road, shops differ with type and size. It is centre of the town and value is highest in the town. Bogyoke Road is on the main road and it is located western part that joins the whole main roads. Ar Zarni road is running along the southern part and Neik Ban road which is located at the northern part of the study area. Dispersed location and large number of services are the result of the services that generally needs urban population (many are large investment). Retail shops based on the different amount of investment and could be divided into static and dynamic natures.

Most of the grocery and food and drinking shops are distributed Ar Zarno road, Neik Ban road, Bogyoke road and U kyaw Yin road. Majority of the personal goods andn fabric shops are concentrated in the Ar Zarni road, Neik Ban road, Bogyoke road, Dawei –Ye road and U Kyaw Yin road. They are main roads of Dawei Town and within CBD area. Distribution of fabric shops are found in linear pattern along Neik Ban road. From the nature of shop, the sellers of fabric shops have to attract customer with attractive shops decoration. So the shops are opened in beautiful layout and concentrating along the main road where the ward is situated on the crossing point of main roads.

Personal goods shops are concentrated Ar Zarni road and in the surrounding areas of Municipal Market and selling specialized goods like medicine, electronic goods, gold, jewelry and etc. Building materials shops have Neik Ban road and Bogyoke road. In Ward, the building materials shops selling building materials, like corrugated iron sheets, cements, etc. Distribution pattern services and other shops can be found around the Ar Zarni road, Neik Ban road, Bogyoke road and U Kyaw Yin road. The ward was built on a well laid out-plan and thus, it bears an appearance of modern urban landscape with parallel roads and street and rectangular blocks.

Generally, economic activities in this ward mostly base on the commercial. As a result, land utilization for residence is largely used and secondly is for commercial activities. In the study areas, commerce and trade have been well developed. Compared with spatial distribution pattern landuse in the study area, commercial landuse is increased that is show in figure (3.2). From that time to early period of 21th century, and the town gradually emerged from subsistent to commercial level together with its urban and residential growth.

According to field study and observation, there are 8 categories of urban landuse in Dawei Town. The largest landuse area is the residential landuse(47.07%). There are many different types of houses are found (eg. thatch/ wacut roof and bamboo wall, corrugated iron roof and timber wall/ brick wall types, etc.). Accordance with the development of economy of the town, the former conservation style, old designed houses, which are located at the centre of the town, are replaced by new modernized concrete roof and concrete or brick wall double storied or triple storied houses. The commercial landuse area is (17.74%), it is second largest landuse type in study area and but industrial landuse area is (0.81%). In the case, although industrial landuse area is the smallest one and the commercial landuse area is the second largest one area in the whole area. It can be said that with the gradual developing economy status for Anauk Myodwin Ward in Dawei Town, it will get further progresses and prospects of the socio-economic activities in the giving environment for near future.

Since at the beginning of the study area, the Dawei Town had experienced economic growth and development but social infrastructures are little fully developed. The standard of living of this area was quite high since earlier times. The major economic activities are fishing, retail and wholesale business and pepper & rubber cultivated and transportation services had increased on natural environment. In addition, most of the residents living in the urban area have developed farming fishing (small scale) and retail and wholesale business. This leads to greater opportunities for employment which may lead to reduction of unemployment problem of the Anauk Myodwin Ward.

In according to the study area are moderate in economy in due to business owners, supermarkets and sale centre, other business and water way transportation to Dawei Township. Hence, the major economy of fishing and transport services such as water way transport and road transportation are able to provide for many people. In addition the better, income generated activities can provide sufficiently for their families in giving landuse pattern and environment. There is few a problems in this area. This problem is for discarding the garbage. Only U Kyaw Yin Street, Municipal Department is discarded the garbage for the residents. It is essential to keep garbage system. Thus, if that problem can be solved, the environmental pollution can be decreased and then beauty and cleanness can be got as a clean environment within the study area.

The findings from the research work clearly show that variation of socio-economic activities effect on Anauk Myodwin Ward is rather sharp as the income distribution is highly varied. The residents are better well-off than those of the urban area. They possess better houses, better maintenance of their environment, good chance of economic activities and owned a host of modern and expensive facilities. On the other hand, the recreational facilities supports from socio-

economic activities in study area are highly favorable for the residents. Another finding shows that there is a sharp spatial variation of social infrastructures in Anauk Myodwin Ward; infrastructures are used as a highly varied. There are civil land uses (Institutional land use): Administrative Office, Health Care Center, Basic Middle School, Kindergarten and Pre-School, Digital Communication Station, Market and Training School, etc. Facilities for the residents of people while is highly used social infrastructure. But there are some social facilities (clean monastery and pagoda are not seen in there.

The study also shows the difference of jobs occupations of the the study areas. They have to work at two or three jobs and to earn enough for the family. While wealthy families in of the study area are more than one job. Land occupied by people is larger than that of other urban area. With the increase in population, there is an emergence of multi-jobs occupation and different income generating operation work that plays an important role for further progress and prosperity of the Anauk Myodwin ward. On the other hand, if the recreational area can be created or achieved in each area, then it will benefit from areas to maintain urban sustainability.

Originally, Dawei River serves as a fishing ground, transportation route, and commodity flow. People of Anauk Myodwin Ward gained much from those social and economic activities in the given natural environment. Since all residents have to depend on it as the sole water transportation route. With the economic development, social infrastructure of the urban area also improved. Social infrastructure improvements are also supported by the government. This development process (social infrastructures) is greatly helped by the Ministry for Progress of Border Area and National Races and Development Affairs. Most of the residents are living in the urban area which are more accessible or can exploit the numerous social infrastructures and economic activities for the urban area. But these social infrastructures can be used by other urban area's residents to a smaller extent.

The economic activities in the study areas are mainly dependent on the exploitation of natural resources. In addition to it, most of the people living in the urban area earned their living by fishing, retail and wholesale economic activities, transportation services and as waged earners .Through this study it has become clear that since the urban residents depend solely on their fishing ground and retailing and wholesales businesses that can be carried out during the three periods of duration. It is possible for the residents to take advantage of the three seasons (summer, monsoon and cool seasons) and suitable for each (business) earning regular income.

Furthermore, it can be said that there are spatial variation of socio-economic activities effect on urban landuse pattern in Anauk Myodwin ward, Dawei Twon. The residents in Anauk Myodwin ward have established the highest levels of residential and economic activities. On the other hand, the residents can use most of the social infrastructures. There are also effected on the urban landuse.

From the above facts, it can be concluded that " there are landuse variations of socio-economic activities effects depending on their sequences of favorable urban landuse pattern and its favourable utilization on landuse pattern. It can improve socio-economic activities on the urban landuse. If the social infrastructures can be enjoyed in the another urban as in the Anauk Myodwin ward then all urban areas will equally benefit from them.

Based on the urban landuse pattern variation effects to social and economic activities, and the benefits of urban economic activities, the benefits on urban sustainability will be considered. Firstly, if the urban settlements have equal opportunity for social infrastructures, how will it be of benefits to the economic and social conditions of the all urban areas? Moreover, most uses of fishing activities are as control and maintain for growth of animals can maintain their ecosystem or effect the environment. As a result, urban economy and social conditions will improve within a

short time. They could enjoy equal benefits both economically and socially. As a result, people in the urban area can direct effect on urban landuse pattern, utilizing the social infrastructure facilities and economic infrastructure available (e. g. transportation and local primary economy). Fresh Fish, Prawn, dried fish and prawn products can also be exported directly. Health Care Services, communication facilities and electric supply, etc will be equally available.

Hence, they can develop these economic activities within a short time. Moreover, if fishing and transportation activities can be carried on in the three seasons, their economic condition will also be improved within a short period. That is collectively then the economic and employment rates will change, and subsequently will be effected by economic multiplier and warehouse functions will take place in the urban area from different sources and different places, that will become from an urban area as mega city if border trade improvement in the near future.

The economic and social activities effects on the urban landuse include a wide range of processes, which are linked to the production and consumption of resources that take places. These help to produce wealth for people and maintain for them a quality of living. Its activities are the most important for people because they provide social and economic conditions and lead to sustainability in each activity. Economic and social conditions are usually due to the processes beyond the control or influence of individual people and lies with the political, social and economic organization, government supported infrastructures and economic opportunities for their living. Hence, the major economy of fishing and retail and wholesale economic activities are able to provide for many people in the Dawei Township. In addition the better, income generated activities can provide sufficiently for their families.

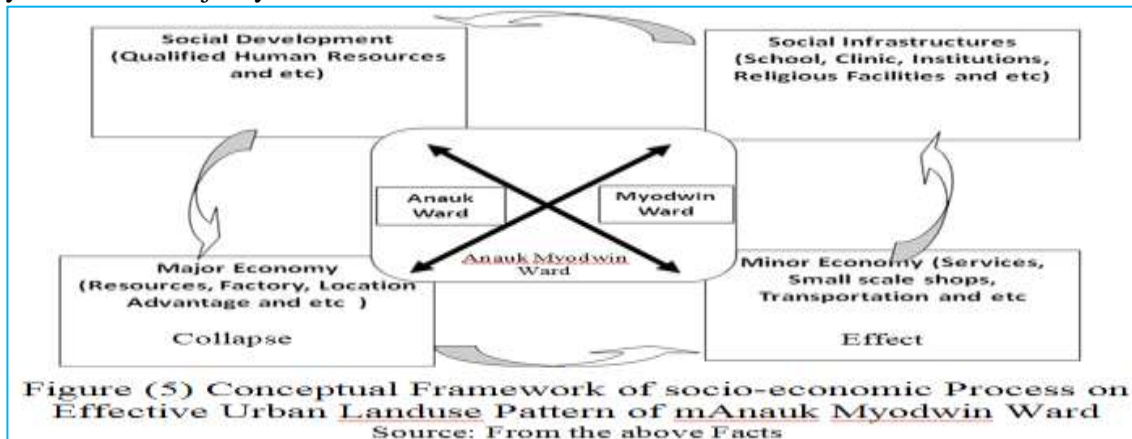
Thus, purchasing power of the residents will be increased. To fulfill this requirement, opportunities are opened for many economic activities. Furthermore, residents invested their surplus income on social facilities like motorcycles, bicycles and modern facilities, motor boat and other requirement facilities. They also improved their living standard by improved water supply, electric supply and education, as well as health care and etc. As a result, consolidated social development occurs. These social developments, on the other hand, benefit the economic development. In this development stage, if the urban people are sustained (or) increase in total development then sustainable urban development can be achieved in the Dawei Township. Moreover, if the social and economic conditions continue to be as the author supposed them to be, then the economy will improve and can provide for all the residents, then the development will be high, and urban people of in Dawei T/S will benefit greatly from the improvement of urban landuse in the near future.

Based on above study, Government supported infrastructures (school, clinic, institutions and etc) and economic opportunities for their living).Agriculture could not support all residents, Fishing , retail & whole sale business related trades were created by allowing favourable urban landuse and fishing activities factory .This major economy was able to feed many people and absorbed further population.

In the development stage, the residents effectively used the infrastructure of urban landuse. In addition, income generated from major economy sufficiently supply for their family. Thus, purchasing power of the residents increased. To fulfill this requirement, other economy like resttaurents, tea shops nad services were developed. Furthermore, residents invested their surplus income on the social facilities like construction of Dhamayon, Monastery, and NGOs (Pa Ya Hi Ta) holding of religious ceremonies and Health care services. They also improved their living standard by improving water supply, electricity, sanitation, education and communication facilities, etc. As a result, consolidated social developments occur. These social developments, on the other

hand, that benefits the economic development. In this development stage, therefore, the population is sustained or increased due to total development on the urban landuse Pattern.

After a second step, Major economy effects to the minor economy and to certain extent social development. Although the social conditions of the Anauk myodwin Ward were still relatively high at present, it will more improve in the near future if there is proper major and minor economy to feed the majority of the residents.



Conclusion

The study area of Anauk Myodwin ward is located not only in the central part of Dawei Town but also in the northern part of Tanintharyi Region. It is composed of fifteen Myoma Wards. It has an area of 10.03 square miles (6421 acres). It is located in the central part of Dawei Town. It is located between 14° 4' 16 "and 14 °4' 28 "North Latitudes and 98 °11' 34" and 98 °11 '50" East Longitudes. The total area of Anauk Myodwin ward is 0.007 square miles (42.2 acres). Its area is 0.697% of the total town area. The shape of the study area is rectangular shape. It is bounded on the north by Ouloke Ward, in the east by Peinetaw Ward, in the south by Zayit ward and in the west by Talainhtein Ward. Dawei Town has Tropical Monsoon Climate (Am) and so, it has fairly good climate. Generally, its soil is fertile and productive. In 2017, the total population is 2237, 1244 females and 993 males. The native ethnic groups of Bamar(Dawei indigenous) , Kayins, Mons, Rakhines and other minorities have their own distinct migration backgrounds.

From that time to early period of 21th century, the town was gradually emerged from subsistent to commercial level together with its urban and residential growth. There was more than settlement in large population aggregates as a factor in emergence of economic activities. Urbanization is the process of increasing population together with the growth of high order urban functions. It may also mean the increased in population pressure in its largest urban centre. Urbanization is a revolutionary process and involves more than settlement in large population aggregates. It involves large population organized in urban way of life. From the above facts, there are eight categories of urban landuse in Dawei Town. The largest landuse area is the residential landuse(47.07%), different types of houses are found (e.g. thatch/ bamboo cut roof and bamboo wall, corrugated iron roof and timber wall/ brick wall types, etc.) with the development of economy of the town, the former conservation style of old designed houses, located at the centre of the town, are replaced by new modernized concrete roof and concrete or brick wall double storied or triple storied houses. The commercial landuse area is (17.74%), it is second largest landuse type in the study area .However the industrial landuse area is just (0.81%), the smallest one in Anauk Myodwin Ward. Although there is the smallest one, the commercial landuse area is the second largest one in the whole area. It can be said that with the gradual improvement of economic status

for Anauk Myodwin Ward, it will get further progresses and prospects of the socio-economic activities in the near future. In Dawei, urbanization process had grown out like other parts of the wards, but there were differences in period of history and characteristics.(1)To collect the document and analyze the current trends in urban landuse development of Anauk Myodwin Ward.(2)To analyze the problems encountered with the urban development of Dawei and the feasible solution to them. (3) To render the constructive advice on how to improve the present urban landuse development from geographical point of view.

Anauk Myodwin ward is between the commercial and residential area. The Central Business Area (CBD) is around the Municipal Zaygyi. In fact, it is the largest and business area. The Municipal Zaygyi and its adjacent areas can be included in the centre or core area. As a result, socio-economic activities highly effect in the urban landuse pattern for the residents. And then, it is largely used for the second level commercial landuse activities for settlements in Anauk Myodwin Ward, Dawei Town. As a result, the improvement of quality of living will is improved with benefits from opportunity of socio-economic activities effective on the urban landuse within a given natural environment , starting from the lowest local level to regional and national levels can be given as a good example.

ACKNOWLEDGEMENT

We are special greatly indebted to the Principal Dr. Myint Swe, Taunggoke Degree College for his permission and guidance to do this research. We would like to thank to professor and Head Dr. Thida Aye, Department of Geography, Taunggoke Degree College for her valuable advice. We are also grateful to General Administration Department of Anuk Myodwin ward for their support in Dawei. We also give our thanks to all the chairmen of the wards that we surveyed for their kind help. And then the people who helped me provide the necessary and relevant information.

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Quality Assessment Of Distributed Purified Drinking Water in Taunggoke Township

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Aye Nyein San⁵

ABSTRACT

Drinking water quality directly affects human health. The present study has been carried out in order to evaluate the potable drinking water quality in Taunggoke Township in 2015-2016 academic year. Physico-chemical parameters like color, odor, taste, pH, COD, DO, TDS, EC, salinity, iron content, chloride content and bacteria content were determined. Four different samples such as Shwe Pyi Rakhine, Wai Tharli Oo, Light and purified drinking water taken from Taunggoke Degree College Campus were collected in order to evaluate and to compare their qualities. An analysis of various parameters and their comparison with the standard values of (WHO) has been done. According to the results, the distributed purified drinking water samples are considered to be safe to drink.

Key words: Drinking water quality, Physico-chemical parameters, the World Health Organization (WHO), distributed purified drinking water

INTRODUCTION

Monitoring of drinking water quality is an important component of water management, while data analysis is necessary for the identification and characterization of water quality problems. Assessment is the process by which water quality data is transformed into information. The quality of drinking water is a crucial factor for human health (Farrukh *et al.*, 2004). Clean water is generally defined as water that is free from microbial, chemical and physical contamination. This includes contaminants that present a health risk (e.g. disease-causing bacteria, toxic metals) and those that have no health risk but can make the water unpleasant to drink (e.g. poor taste resulting from high iron levels). Microbial contamination refers to the presence of disease-causing (or pathogenic) microbes, which are generally introduced to water sources by contact with faecal material. Common examples include *Salmonella Typhi* and *Vibrio cholerae*, which respectively cause typhoid fever and cholera, as well as pathogenic strains of *Escherichia coli* (*E. coli*). The World Health Organization (WHO) considers microbial pathogens the highest priority in water treatment given their ability to cause infectious disease. Coliform bacteria are organisms that are present in the environment and in the feces of all warm-blooded animals and humans (WHO, 2007). Coliform bacteria will not likely cause illness. However, their presence in drinking water indicates that disease-causing organisms (pathogens) could be in the water system.

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Most pathogens that can contaminate water supplies come from the feces of humans or animals. Testing drinking water for all possible pathogens is complex, time-consuming, and expensive. It is relatively easy and inexpensive to test for coliform bacteria. If coliform bacteria are found in a water sample, water system operators work to find the source of contamination and restore safe drinking water (Memon *et al.*, 2011).

There are three different groups of coliform bacteria; each has a different level of risk. Total coliform, fecal coliform, and *E. coli* are all indicators of drinking water quality. Total coliform bacteria are commonly found in the environment (e.g., soil or vegetation) and are generally harmless. If only total coliform bacteria are detected in drinking water, the source is probably environmental. If environmental contamination can enter the system, there may also be a way for pathogens to enter the system. When total coliform bacteria are confirmed in drinking water, a water system or utility is required to notify its customers within 30 days about the situation (Soomro *et al.*, 2011).

The presence of fecal coliform in a drinking water sample often indicates recent fecal contamination, meaning that there is a greater risk that pathogens are present than if only total coliform bacteria is detected. *E. coli* is a sub-group of the fecal coliform group. Most *E. coli* bacteria are harmless and are found in great quantities in the intestines of people and warm-blooded animals. The presence of *E. coli* in a drinking water sample almost always indicates recent fecal contamination, meaning there is a greater risk that pathogens are present. Confirmation of fecal coliform bacteria or *E. coli* in a water system indicates recent fecal contamination, which may pose an immediate health risk to anyone consuming the water. Boiling or treating contaminated drinking water with a disinfectant destroys all forms of *E. coli* (Haydar *et al.*, 2009).

Chemical contamination refers to metals, organic compounds and other chemicals that present potential health risks. Water naturally contains many chemicals (sodium and calcium, for example), most of which present no health concerns. A few chemicals, however, do present human health risks, especially for children and when contaminated water is consumed over time. They can stem from both natural sources and human activity like industrial waste disposal and agriculture (Saddozai *et al.*, 2009).

Physical contamination refers to conditions relating to the water's physical condition, for example color, odor, temperature and turbidity (cloudiness resulting from the presence of small particles like pieces of soil). Most of these present no direct health risk, but they can influence other factors (e.g. soil particles in turbid water can shelter bacteria) and sometimes make water unpleasant to drink (Ahmad *et al.*, 2012).

Environmental pollution is the global concern of today. The growth of industrial area is rapid and very fast thus related anthropogenic activities have also been increased like waste discharge from industries, transportation and domestic activities. The domestic waste generated is directly enters into the different sites of water bodies without any treatment. Also the continuous flow from agricultural waste water contaminates the water source of surrounding area. This entire problem affects the water resources and ultimately human health. Water is one of the three major components of the environment; therefore, there exists a close linkage between the quality of water and the environment which bears an almost importance for eco-system. Natural bodies of water are not absolutely pure as various organic compounds and inorganic elements remain in dissolved form. The physical and chemical quality of water vary according to the basin shape and size, depth, light penetration, precipitation, location, temperature, chemical nature of surrounding soil and dissolved minerals, pH, etc, and the biological components of the habitats depend upon them. If all the physical, chemical and biological parameters are in optimum condition, the balance between these is maintained (Khan *et al.*, 2012).

The present work was carried out in order to study the purified drinking water quality of four different samples. The parameters like color, odor and taste were analyzed by visual and drinking. DO, BOD, TDS, EC and pH were analyzed with the help of water test kit. COD was determined by titration method. TDS is a general indicator of overall water quality. It is a measure of inorganic and organic materials dissolved in water. Increased TDS may impart a bad odor or taste to drinking water.

MATERIALS

Drinking water samples for analysis were collected from Taunggoke Degree College Campus. Analytical grade chemicals were used for preparing all reagents and solution. * Iron Reagent # 1(4450).cap and * Iron Reagent # 2 Power (4451) for iron content, Chloride Reagent #2 (4505DR) contained silver nitrate for chloride content were applied by the use of water test kit (LaMatte, Test Kit Instruction Manual Code 5905-02).

METHODS

For the analysis of water quality, the main water quality indicator parameters were detected from the laboratory including physicochemical quality. Physico-chemical parameters like color, odor, taste, pH, COD, DO, TDS, EC, iron, chloride, salinity and bacteria content were determined. The physicochemical quality included: electrical conductivity (EC), pH, dissolved oxygen (DO) and total dissolved solid (TDS) were determined in the laboratory with the help of water test kit. Then iron, chloride and salinity contents were analyzed. COD values were determined by titration with KMnO_4 (new method approved by United Nations Environment Programme Global Environment Monitoring System (GEMS)/Water Programme, in collaboration with the International Atomic Energy Agency, Method code- 08305). All tests were performed at least three times to calculate the average values.

Questioners to the consumers were used to obtain information about physical qualities like color, taste and odor. Taste in water can be traced to a number of factors including decaying organic matter, living organisms, iron, mixing industrial waste etc.

RESULTS AND DISCUSSION

Physicochemical and Bacteriological Properties of Purified Drinking Water Samples

The results of the study are presented in Table 1. Shwe Pyi Rakhine and Wai Tharli Oo have little less pH values than that of the acceptable level of WHO standard and are slightly acidic. Light and drinking water from Campus are slightly alkaline, and are generally considered safe. Electrical conductivity (EC) is measured by passing an electric current through the water and measured how readily the current it flows. EC of water also estimates the total amount of solids dissolved in water- TDS, which stands for total dissolved solids. The excellent TDS values are less than 300ppm; good, between 300 and 600ppm; fair, between 600 and 900ppm; poor, between 900 and 1200ppm; and unacceptable, greater than 1200ppm. Although all samples have more or less EC and TDS, they are excellent within the acceptable values.

Permission limits for various parameters for drinking water can be found in WHO standard. In environmental chemistry, the chemical oxygen demand (COD) is an indicative measure of the amount of oxygen that can be consumed by reactions in a measured solution. Therefore, COD for drinking water should be nil. Dissolved oxygen (DO) levels will also fluctuate with temperature, salinity and pressure changes. As such DO levels can range from less than 1 ppm

to more than 20 ppm depending on how all of these factors. According to the Table 1, all samples have some distinct COD and DO values.

The salinity was not detected in Wai Tharli Oo and Shwe Pyi Rakhine whereas higher salinity was found in Light and drinking water from Campus. The chloride contents in all samples are very less than the WHO standard. In all samples, iron is not completely detected.

Coliform bacteria will not likely cause illness. However, their presence in drinking water indicates that disease-causing organisms (pathogens) could be in the water system. Boiling or treating contaminated drinking water with a disinfectant destroys all forms of E. coli.

Table 1. Physicochemical and Bacteriological Properties of Drinking Water Samples

Parameter	Light	Wai Tharli Oo	Shwe Pyi Rakhine	Drinking water from Campus	WHO
pH	7.4	6.3	6.2	7.8	6.5-8.5
EC(μ S/cm)	198	26	26	94	400
TDS(ppm)	78	26	19	47	500
DO(ppm)	7.6	7.5	7.6	7.5	5
COD(ppm)	2.4	9.6	7.2	19.2	10
Chloride(ppm)	24	14	12	16	250.0
Salinity(ppm)	100	0	0	100	<100
Iron(ppm)	ND	ND	ND	ND	0.3
E.coli	0	0	0	0	0

CONCLUSION

Since there is no *Escherichia coli* (E.coli) and iron in all samples, the distributed purified drinking water samples in Taunggoke Township are considered to be safe to drink.

ACKNOWLEDGEMENTS

We would like to express our gratitude to Dr Myint Swe, Principal of Taunggoke Degree College and Dr Win Naing (Professor and Head), Department of Chemistry, Taunggoke Degree College for their permission to do this research paper.

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Determination of Vitamin C (ascorbic acid) Contents in Green and Red Pepper Samples from Taunggoke Township by using UV-spectrophotometry and Titration Method

Kyi Kyi Lwin¹, Kay Thi Win Khin², Kyaw Ko Oo³, Khin Myo Zin⁴

Abstract

In this research, vitamin C contents were determined in green and red pepper samples. The samples were collected from local market in Taunggoke Township. Total vitamin C (ascorbic acid) has been investigated using two methods, Iodometric titration method and UV-spectrophotometric method. The Iodometric titration method was used for this determination with iodine solution and starch as indicator. In this case, the end point has been seen when the starch binds to the iodine and then the blue black complex is formed. The vitamin C was dyed with 2,4-dinitrophenyl hydrazine and the coupling reaction of them and was followed by spectrophotometric determination. The values obtained for ascorbic acid contents were found in the range of 41.32 to 26.05 (mg/100g) by titration method and 13.04 to 38.11 (mg/100g) by spectrophotometric method. The results revealed that ascorbic acid content was very high in ripe pepper of sample B(r) and green pepper samples have low values. The content of total ascorbic acid in different samples was compared with results of spectrophotometric method.

Keywords: Iodometric titration, UV-spectrophotometric, Ascorbic acid, 2,4-dinitrophenylhydrazine

1. Introduction

1.1 Vitamin C (Ascorbic Acid)

Vitamin C is defined as the generic term for all compounds exhibiting the biological activity of L-Ascorbic Acid. Vitamin C, has the chemical formula $C_6H_8O_6$ (Fig 1) and a molecular weight of 176.12. This water-soluble vitamin is important in forming collagen, a protein that gives structure to bones, cartilage, muscle, and blood vessels. It also helps maintain capillaries, bones, and teeth and aids in the absorption of iron. Ascorbic acid plays an important role as a component of enzymes involved in the synthesis of collagen and carnitine; however, its most vital role is as a water-soluble vitamin in the human body (Levine et al., 1999).

Ascorbic acid is a powerful antioxidant because it can donate a hydrogen atom and form a relatively stable ascorbyl free radical. Ascorbic acid facilitates the absorption of iron. (Deekshika et al., 2015)

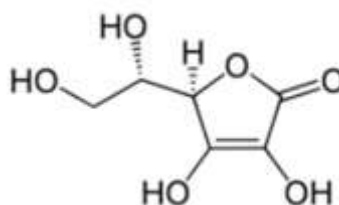


Figure 1 The molecular formula for ascorbic acid is $C_6H_8O_6$.

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1.2 Effect of Ascorbic acid Deficiencies

Severe deficiency of ascorbic acid causes scurvy. Symptoms appear when the serum level falls below 0.2 mg/dl. A total body pool of less than 300 mg is associated with symptoms of scurvy, while maximum body pools are limited to about 2 g (IOM, 2000). Several symptoms of ascorbic acid deficiency have been recognized including follicular hyperkeratosis, swollen and inflamed gums, loosening of teeth, dryness of the mouth and eyes, loss of hair and dry itchy skin. These symptoms reflect the role of ascorbic acid in the maintenance of collagen and blood vessel integrity. The psychological manifestations of scurvy include depression and hysteria. This potentially fatal disease can be prevented with as little as 10 mg ascorbic acid per day, an amount easily obtained through consumption of fresh fruit and vegetables. (Teodoro, et al., 2013)

The Ascorbic acid needs taken in setting requirements and the levels recommended by FAO/WHO (2002) consultation report are shown in table 1.

Table 1 Recommended Intakes for Ascorbic acid

Group	Age	RNI (mg/day)
Infants	0 – 6 months	25
	7 – 11 months	30
Children	1 – 3 years	30
	4 – 6 years	30
	7 – 9 years	35
Boys and Girls	10 – 18 years	40
Men and Women	19 – >65 years	45

*FAO/WHO (2002)

1.3 Toxicity and tolerable upper intake levels of Ascorbic acid

Saturable intestinal absorption and renal tubular reabsorption data suggest that overload of ascorbic acid is unlikely in humans. The FAO/WHO (2002) report pointed out that the potential toxicity of excessive doses of supplemental ascorbic acid relates to intra-intestinal events and to the effects of metabolites in the urinary system. Intakes of 2–3 g/day of ascorbic acid produce unpleasant diarrhoea from the osmotic effects of the unabsorbed vitamin in the intestinal lumen in most people. Gastrointestinal disturbances can occur after ingestion of as little as 1 g because approximately half of the amount would not be absorbed at this dose. Oxalate is an end product of ascorbate catabolism and plays an important role in kidney stone formation. Excessive daily amounts of ascorbic acid produce hyperoxaluria. The risk of oxalate stones formation may become significant at high intakes of ascorbic acid (>1 g), particularly in subjects with high amounts of urinary calcium. The FAO/WHO Consultation felt that 1 g ascorbic acid appears to be the advisable upper limit of dietary intake. (Tee, et al. 1997)

1.4 Peppers

Hot peppers, also known as chili (or chile) peppers, owe their “heat” or pungency to a chemical substance called capsaicin. This chemical is concentrated in the cross walls of the fruit and around the developing seeds. Chili peppers can be mild to fiery hot, depending on the amount of capsaicin present. Peppers that do not contain capsaicin, such as bell peppers, are considered “sweet.” (Kaiser, et al., 2014)

The popularity of spicy foods has also increased the demand for locally grown fresh chili peppers. Pepper varieties differ in fruit size, color, shape, flavor, capsaicin levels, and number of lobes. While standard bell cultivars ripen from green to red, specialty bells may ripen to various shades of yellow, orange, brown, white, and purple. (Campos, et al., 2013)

1.5 Ascorbic acid in Peppers


Fresh peppers are also excellent sources of ascorbic acid (vitamin C), which participates in several antioxidant processes in peppers besides acting in the prevention of human chronic diseases, including certain types of cancer, coronary disorder, arteriosclerosis and cataracts (Rahman, et al., 2006). The hot peppers have great importance in tropical regions of the world. In Rakhine region, peppers are irreplaceable ingredients in several regional dishes. From the perspective of plant breeding, the characterization of the accessions with higher vitamin C content is interesting. Because of the red pigmentation of several samples of pepper, vitamin C content determined by classical method of dichlorophenolindophenol (DCFI) may suffer interference at the turning point.

2. Material and Methods

2.1 Sample Collection and Handling

Fresh peppers samples were purchased from local market in Taunggoke Township. Proper labeling can be made on each sample as: Local name and Shape of various pepper samples. Table 2 showed the local name and code of pepper samples from Taunggoke Township.

Table 2 Local name and shape of various pepper samples

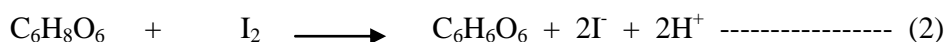
Sr No	Code	Local name	Shape
1	B(g)	Bamar thee (green)	
2	B(r)	Bamar thee (red)	
3	T(g)	Taungyar thee (green)	
4	T(r)	Taungyar thee (red)	

2.2 Materials and Methods of Analyses

In all the investigations, more than three replicate experiments were performed, unless otherwise stated. All experimental data were computed on the statistical basis. Ascorbic acid in pepper samples can be rapidly and easily titrated using a standard solution of iodine as titrant called Iodometric titration and spectrophotometric methods are used to find the total ascorbic acid content of various juice, fruits and vegetables.

2.3 Iodometric titration

The determination and analysis of ascorbic acid in the fruits will be found by using iodometric titration. Iodometric titrations are similar to normal titration but the titrant involves an iodine solution and a starch indicator.



Once the iodine is made, it can react with the starch to form the blue black complex. In this case, when the starch binds to the iodine making the blue black complex is formed. For this experiment, green and red peppers will be compared on their contents of ascorbic acid in milligrams. (Majidi, et al., 2016)

2.4 Standardization of the Iodine Solution Procedure

Three samples of solid ascorbic acid, approximately 5 mg, 7 mg and 10 mg each are weighted and placed into three 150 mL conical flask. Add About 30ml distilled water and 4 to 5 drops of starch solution were added to each flask and titrated with prepared 0.005 M Iodine solution until the colour changes obtain a permanent dark blue-black color due to the starch iodine complex. This titration was repeated to get concordant values. The initial and final volume readings were sure to record from the burette. The concentration of the Iodine solution was calculated for use in the titration of ascorbic acid in peppers samples.

2.5 Determination of Vitamin C in Pepper samples by Iodometric titration method

2.5.1 Sample preparation

Before the extraction procedure, all the samples were thoroughly cleaned using deionized water to remove any adhering contaminants if present. Vitamin C in the samples was determined on the same day of purchase to avoid the instability of vitamin C. 100 g of the edible portion of each of the samples were accurately weighed and ground to a homogenize in a blender. 10 mL portions of distilled water were added several times to a ground sample, each time decanting off the liquid extract into a 100 mL volumetric flask. Finally, strain the ground pulp through cheesecloth, rinsing the pulp with a few 10 mL portions of water and collecting all filtrate and washings in the volumetric flask. The extracted solution was made up to 100 mL with distilled water.

2.5.2 Procedure

Measure 10 mL of sample solution into a 150 mL conical flask. Add About 40ml distilled water and 4 to 5 drops of starch solution were added to flask and titrated with standardized Iodine solution. The end point of the titration was identified as the first permanent dark blue-black color due to the starch iodine complex. This titration was repeated to get concordant values. The initial and final volume readings were sure to record from the burette. The amount of the Ascorbic acid content in prepared peppers sample solution was calculated.

2.6 Determination of Vitamin C in Pepper samples by Spectrophotometric method

2.6.1 Sample preparation

10 grams of sample was blended was homogenized with about 50 mL of 5% metaphosphoric acid - 10% acetic acid solution. Then it was transferred into a 100 mL volumetric flask and was shaken gently until a homogeneous dispersion was obtained. Then it was diluted up to the mark by the 5% metaphosphoric acid-10% acetic acid solution. Then the solution was filtered and filtrate was collected for the determination of vitamin C in that sample.

2.6.2 Procedure

To the filtered sample solution few drops of bromine water were added until the solution became colored (to confirm the completion of the oxidation of ascorbic acid to dehydroascorbic acid). Then few drops of thiourea were added to it to remove the excess bromine and thus the clear solution was obtained. Then 2,4-dinitrophenyl hydrazine solution was added thoroughly with all standards and also with the oxidized ascorbic acid. Total vitamin C employing coupling reaction of 2,4-dinitrophenyl hydrazine dye with vitamin C at 37°C temperature for three hours, the solution is treated with 85% H₂SO₄ to produce a red colour complex and followed by spectrophotometric determination. The absorbance of the coloured solution was measured at 512 nm in a 1 cm cell against a reagent blank (Rahman, et al., 2006). The amount of Ascorbic acid content (mg/100g) in prepared pepper sample solution was calculated (cf. section 3.3).

3. Results and Discussion

This study focuses on the determination of Ascorbic acid contents in the green and red peppers samples. The samples were collected from local market in Taunggoke Township, during the rainy season. Table 3 represents the sampling sites of peppers samples.

Table 3 Sampling sites of green and red pepper samples

Sr No	Code	Sample sites
1	B(g)	Taunggoke Township
2	B(r)	Taunggoke Township
3	T(g)	Taunggoke Township
4	T(r)	Taunggoke Township

3.1 Ascorbic acid Contents of green and red pepper samples by Iodometric titration method

The contents of Ascorbic acid in the green and red pepper samples were shown in Table 4. In this research (cf. section 2.6), the values of Ascorbic acid contents were found in the range of 41.32 to 26.05 mg/100g. Green and red samples of same species were not much different amount of ascorbic acid content. The samples, B(g) and B(r) were higher value of ascorbic acid content than T(g) and T(r). It was also found that red pepper more contain the ascorbic acid content than the green pepper sample.

Table 4 Ascorbic acid contents in green and red pepper samples by Iodometric titration method

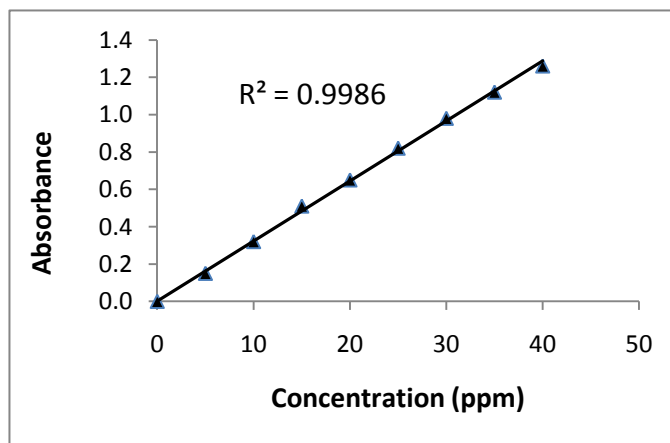
Sr.No.	Pepper samples	Conc. of I ₂ solution (M)	Sample volume (mL)	Titrant volume (mL)	Ascorbic acid (mg/100g)
1	B(g)	0.0051	10	4.1	36.82
2	B(r)	0.0051	10	4.6	41.32
3	T(g)	0.0051	10	3.5	26.05
4	T(r)	0.0051	10	2.9	32.34

3.2 Construction of standard calibration curve for Ascorbic acid content determination

The λ_{max} of the 2,4 DNPH with ascorbic acid colored complex (521 nm) (Khan, et al, 2005) using a UV- spectrophotometer the absorbance of the all standards were taken to construct a calibration curve. The calibration curve was constructed by plotting the concentration versus the corresponding absorbance. Table 5 showed relationship between absorbance at 521 nm and ascorbic acid content. According to this table, the standard calibration curve (Figure 2) is linear and passing the origin, therefore Beer's Law was obeyed with the r^2 value of 0.9986.

Table 5 Relationship between Absorbance at 521 nm and Ascorbic Acid Content

Sr No	Ascorbic acid conc: (ppm)	Absorbance at 521 nm
1	0	0
2	5	0.15
3	10	0.32
4	15	0.51
5	20	0.65
6	25	0.82
7	30	0.98
8	35	1.12
9	40	1.26

**Figure 2 Construction of standard calibration curve for Ascorbic acid determination**

3.3 Ascorbic acid Contents of green and red pepper samples by Spectrophotometric method

The contents of Ascorbic acid in the green and red pepper samples were shown in Table 6. In this research (cf. section 2.6), the values of Ascorbic acid contents were found in the range of 13.04 to 38.11 mg/100g. Red pepper samples were obviously higher value of ascorbic acid content than green pepper samples. The sample B(r) (local name, Bamar thee) was the highest value of ascorbic acid content and it is hotter than T(r) (local name, Taungyar thee). Comparable result to the Ascorbic acid contents by two methods with pepper samples plot was shown in Figure 3. The two results were much not different in Ascorbic acid contents.

Table 6 Ascorbic acid contents in green and red pepper samples by Spectrophotometric method

rNo	Pepper samples	Ascorbic acid content (mg/100g)
	B(g)	17.02
	B(r)	38.11
	T(g)	13.04
	T(r)	25.34

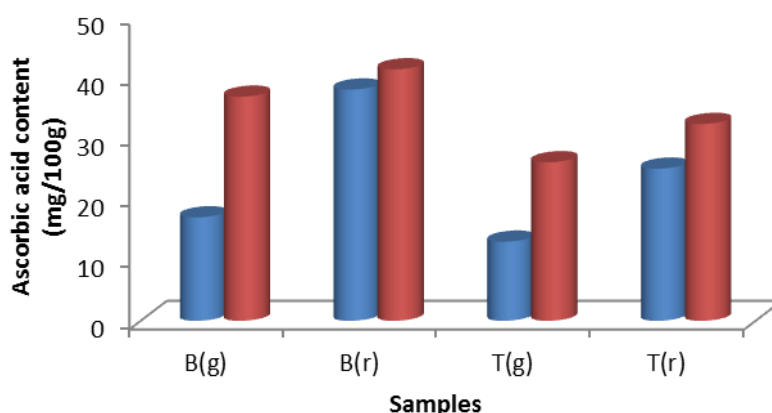


Figure 3 The plot of comparable result to the Ascorbic acid contents by two methods with pepper samples

This research work is to study the contents of Ascorbic acid in green and red pepper samples from Taunggoke Township market. The ascorbic acid content in these pepper samples were determined by volumetric method and spectrophotometric method. In Iodometric titration method, the values of Ascorbic acid contents were found in the range of 41.32 to 26.05 mg/100g. Green and red pepper samples of same species were not much different amount of ascorbic acid content. In spectrophotometric method, the values of Ascorbic acid contents were found in the range of 13.04 to 38.11 mg/100g. Ripe peppers more contain the ascorbic acid content than the green pepper. The sample B(r) (local name, Bamar thee), hot pepper was the highest value of ascorbic acid. Comparison of results obtained by titration method is a good agreement with results obtained by spectroscopy method. These results clearly suggest that a wide variety of pepper can be consumed to meet the daily requirements of vitamin C in a cost effective manner.

Acknowledgement

The authors would like to acknowledge to Professor Dr Win Naing, Head of Chemistry Department, Taunggoke Degree College, for providing the department facilities, encouragement and invaluable guidance.

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Study on fishing gears and crafts operating target sciaenid fish in Mon Coastal waters

Ohnmar Min*

ABSTRACT

Study of fishing techniques in Mon Coastal waters was carried out in three different areas in the year of June 2016 to May 2017. The information about different types of gears and crafts were taken by monthly visit to the important fishing sites. The aim of this paper is to record the fishery related technological knowledge specially fishing gears and crafts target two commercial sciaenid fish used in Mon Coastal regions. Fishing gears were bottom gill net, stationary bag net and otter trawl net. Fishing crafts were small fishing boat, nga-paung-hlay, ye-pyan-hlay and wan-lat.

Keywords: fishing gears, crafts, sciaenid fish.

INTRODUCTION

In Mon State, Zephyuthaung area support a rich fishery in varied intensities, consisting of sciaenids (croaker). These fishes are purchased by the few processing plants in the village for export, mainly to China and Thailand. Fisheries catches of the study areas include multiple species of fish and crustacean shellfish. These are annually harvested using traditional (bag nets, gill nets fishery) fishing gears and crafts.

The present paper dealt with some aspects of the fishery of two commercial sciaenid fish (*Chrysochir aureus* and *Otolithoides pama*), which were the most important species as regard to abundance, in the bottom gill net catches at selected landing centres: Mawlamyine, Kyaikkhami and Zephyuthaung study areas. Gill net fishing vessels are second most important in Myanmar fishery in Mon State at that time (Sann Aung, 2003).

Khin Maung Aye *et al.* (2006) stated that the fishing gears used in inland fisheries were traditionally developed from small-scale fishing activities and it could fish in large quantity during the rainy season from June to September. He also stated that fishing could be done all year round in rivers and inn. In inshore fishery, fishing was operated within around 9.66 km from the shore and at the depth of 15 m while offshore fishery operated in the wide area of 96.56 km of the shore at the depth of 15 – 70 m as reported by Khaing Myat Myat Htwe (2012).

Aamir (2015) investigated in Punjab of India that the different types of water bodies spread over vast area and eight different types of gears (drag net, stationary gill net, cast net, ring cast net, entangling net, encircling net, fish trap and hook and line) and two fishing crafts (pirogue and dinghy). Then he also described that the passive and active gears. Passive gears are stationary gears. It does not have to be draffed, pulled or toward to capture fish. The catch is recovered by simply removing the gear from the water a time period. No energy is expended on towing, pulling or dragging of gear. Active gears have to be moved, dragged, or towed in order to capture fish. They usually require engine-propelled boats and usually involve additional investment over passive or stationary gears.

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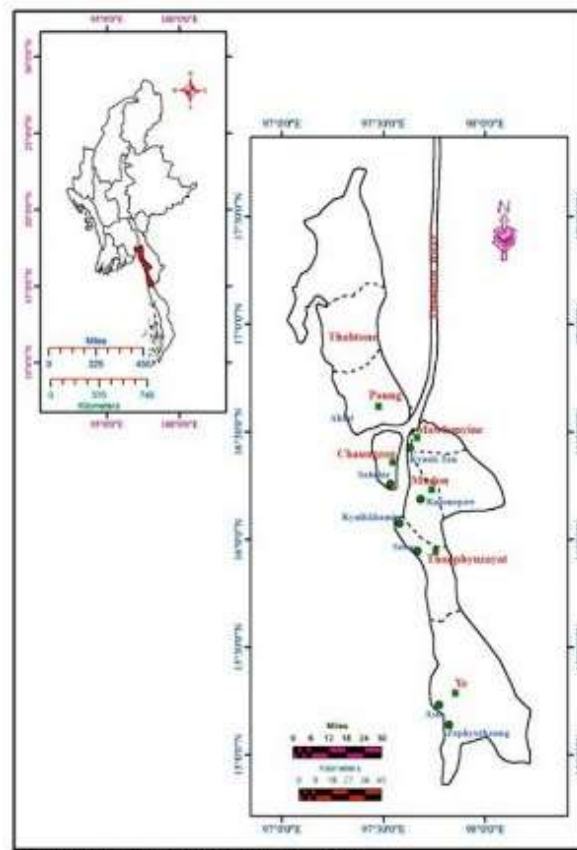
Thus, the present study was conducted with the following objectives:

- (1) To observe how many types of fishing gears used by fisherman target two commercial sciaenid fish in Mon coastal waters
- (2) To record the length, width, height and mesh size of fishing gears and crafts target these fish

MATERIALS AND METHODS

The study period was June 2016 to May 2017. The survey was carried out during June to November 2016 in three study areas of Mon Coastal waters which are known for fishing. The information about different types of gears and crafts were taken by monthly visit to the important fishing sites of Mon State namely, Mawlamyine (Lat. $16^{\circ}29'N$, Long. $97^{\circ}38'E$), Kyaikkhami (Lat. $16^{\circ}03'N$, Long. $97^{\circ}33'E$), and Zephyuthaung (Lat. $15^{\circ}11'N$, Long. $97^{\circ}46'E$).

An interaction based data collected from fishing site, professional fishermen, net makers and net shopkeeper. At the sites the photos of different types of gears and crafts were captured by a digital camera and sketch were also described. The measurement of length, diameter (width), height (in crafts) and length, depth (width), mesh size (in gears), were taken by scales.



Source: Agricultural Atlas, The Republic of Union of Myanmar, 2002

Figure 1. Map showing the study areas along

RESULTS AND DISCUSSIONS

1. Description of fishing gear target *Chrysochir aureus* (sciaenid fish) in marine capture (Bottom gill net - passive gear)

The bottom gill net in marine capture was shown in Figure 2 and 3. Nylon monofilament was popular and was used more than nylon multifilament for netting material for gill net. The specifications such as the mesh size, the length and depth of the net and hanging ratio vary for different species.

The length of net was (64) m and the depth was (12) m. The mesh size was (85) mm. The most common kind of net rope for gill net was nylon of (0.4) mm diameter. These nets were fixed to the bottom or at a certain distance above it, by means of bamboo poles.

Bottom gill nets were operated in shallow waters or sea areas where the depth ranged between (5) m or (30) m. The upper rope of net, which was used to straighten the net, was 8 mm in diameter, while the bottom rope of net, which was tied to the lead ball, was 4 mm. The number of floats tied to the net was 90 in each set of net. The distance between each float was 0.7 m.

The number of lead balls tied to the base of net was 100 in each set of net. The weight of one lead ball was from 25 gm to 30 gm. The total weight of lead in one set of net was about 2500 gm. The distance between one lead ball and the next was 0.6 m. The distance between marker floats which are on the water surface was 32 m.

The length of marker float was 0.3 m and the diameter of marker float was 0.1 m. The length of rope between the upper tip of net and marker float was 30 m. The diameter of the rope was 0.3 mm and the type was nylon. The diameter of nylon rope tied to each float to make the net straight was 0.5 mm.

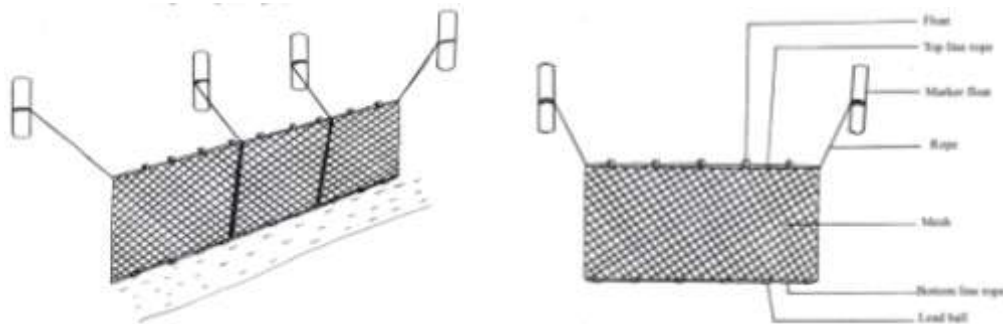


Figure 2. A-B. Sketch bottom gill net in marine capture (passive gear)



Figure 3. A) Net maker, B) Marker float, C) Float, D) Lead

2. Description of fishing gear target *Otolithoides pama* (sciaenid fish) inland capture (Stationary bag net or tidal set bag net - passive gear)

The stationary bag net for inland capture was shown in Figure 4 and 5. It was conical in shape like trawl net, with or without wings depending on the local practice and experience. The mouth of the net was fastened to two fix poles against the current. When the current carrying the fish goes through the net, fishes were collected in the cod-end.

Small scale bag nets were operated year round during day or at night. They were used four times daily; twice during high tide and twice during ebb tide. During high tide, the net's mouth faces towards the incoming tidal current and in ebb tide, the net's mouth faces towards the outgoing tidal current.

The length of net was (65) m and the depth of the mouth was (6) m. Mesh size was (100) mm at the net mouth-end and (10) mm at the cod-end. The most common kind of net rope for bag net was made of polyethylene twine of 380 D/6 to 380 D/12 nylon multifilament of (0.5) mm in diameter. The diameter of upper rope of net, which was used to straighten net, was 25 mm. The number of floats tied to the mouth of net was 80 in each set of net. The distance between each float was 0.5 m.

One line fixed poles consisted of a total of 60 woody poles were tied together and planted into the floor of the river. On the other side, about 60 m away another similar 60 wooden poles were tied together and planted into the floor of the river. The length of each wooden pole was about 4 m and 80 mm in diameter. Sixty iron wire ropes, each measuring 7 m in length and about 10 or 20 mm in diameter were used to tie each planted woody poles to the knob ring. A 0.5 m long, molar block was tied to the knob ring with 35 mm diameter wire.

In shallow waters, the wire was about 16 m long and in deep waters, the length was about 20 m. Between molar block and arm of net was 10 m long join wire. Three bamboo poles were tied together at that junction. These bamboo poles were submerged in the water. Eight net eyes were situated around the net's mouth, between two arms of net.

At net's mouth, 9 m long and 100 mm in diameter supported bamboo pole were used at the site of net's eyes to prevent the constriction of net's mouth and to maintain the net's expansion. These nets were operated in shallow waters or sea areas where the depth ranges between 15 m or 20 m.



Figure 4. A-B. Sketch tidal bag net in inland capture (passive)



Figure 5. A-B. Tidal bag net in inland

3. Description of fishing gear target two sciaenid fish in marine capture (Otter trawl net – active gear)

The otter trawl net has a bag of netting in shape and larger (Figure 6 and 7). They are the major nets used for demersal fishing. The sides of the bag are extended outwards by the addition of wings of netting to large, rectangular, wooden “otterboards”. The otterboards are towed by a pair of very strong steel cabins, the warps, which are attached to the otterboards in such a way that the pressure of water causes the otterboards to diverge as they move, pulling the mouth of the net wide open horizontally.

The under-edges of the otterboards slide over the seabed and are shod with steel for protection. The head-rope to which the upper lip of the trawl net is laced, is usually about 30 - 40 meters long, and bears numerous hollow metal floats which keep it a few meters above the bottom. These nets were used in sea areas where the depth ranges between 80 - 90 m.

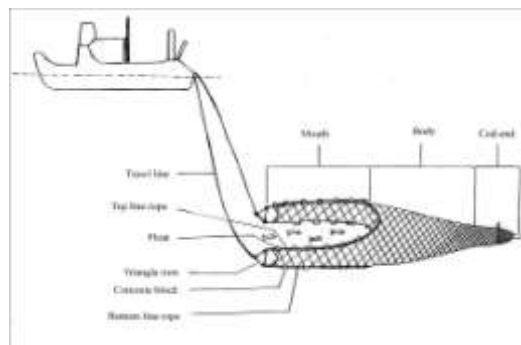


Figure 6. A. Sketch otter trawl net marine capture (Active gear)



Figure 6. B. Selecting and preparing the otter trawl net



Figure 7. Otter trawl net in marine capture (Active gear)
A) Net, B) Marker floats, C) Hollow metal float, D) bottom sand bags

4. Description of small fishing boat target *Otolithoides pama* in the Thanlwin river (Figure 8)

The small fishing boat / Nga-hpan-hlay has a capacity of only two fishermen that can propel the boat at the two end points. The boat is usually 1.5 m long, 0.3 m width and equipped Chinese engine. Internally partitioned by multi-piece wooden logs from strength and nesting to overcome jumbling of fishes. The boat is usually used for carrying fishes from catchment area to bank of the river.



Figure 8 (A-B). Small fishing boat / Nga-hpan-hlay

5. Description of fishing boat target *Chrysochir aureus* in marine capture (Figure 9)

The dimension of gill net boat was about 13 m long, 3 m wide and 4 m high. Chinese engine, HP 80 was used. The cost of some boats was about 150 to 200 lakhs kyats. Each gill net boat had about 200 sets of net for catching fish and 8-10 workers. About 20% of the boats were anchored in the sea and went to the jetty about once in three months. The fish were carried to the jetty by using carrier boat, locally called “Kae” hlay or Nga-paung-hlay.

However, about 80% of gill net boats made 4-6 days fishing trips, carried ice in insulated fish-holds. One trip carried about 12-15 ice boxes. One ice box contained about 500 kg of fish. After landing, fish was transported to market by yoked baskets, trolley cars, etc. Almost 30% of the landed fish was marketed fresh; about 40% was transported as fresh fish with ice and marketed; 20% was sun-dried and salted and the rest was made into nga-pe.



Figure 9 (A-B). Nga-paung-hlay / “Kae” hlay

6. Description of fishing boat target *Otolithoides pama* inland capture (Figure 10)

Ye-pyan-hlay or daily trip fishing boat was a round bilge carvel planked boat, usually built with 'Thitmar' or hard wood. They are used for catching fish with gill nets in Mawlamyine and engaged in daily fishing; do not carry ice on board for preservation of the catch. The catching is done two times within 24 hours, once during high tide and another during ebb tide.

After landing, fish was transported to market by car or by motorbike. The landed fish was marketed fresh or was transported to the company as iced fish. The cost of Ye-pyan-hlay or daily fishing boat was about 50 lakhs kyats. The dimension of the boat was about 9.5 m long, 1.5 m wide and 3 m high and used Chinese engine HP 40. One boat has eight sets of net and four workers. One trip carried about 4 ice boxes. One ice box contained about 50 kg of fish.

Some fishing boats cost about 20 lakhs kyats. The dimension of the boat was about 8.5 m long, 1.0 m wide and 1.0 m high and used Chinese engine HP 25. One boat had three sets of net and two workers. One trip carried about 2 or 3 ice boxes. One ice box contained about 25 kg of fish.



Figure 10 (A). Ye-pyan-hlay
(about 50 lakhs kyats)



Figure 10 (B). Ye-pyan-hlay
(about 20 lakhs kyats)

7. Description of fishing boat target the two economically important sciaenid fishes in marine capture (Figure.11)

Bottom trawl or otter board trawler (Wan-lat) were used for deeper regions marine fish at Ye township. The cost of this boat was about 800 lakhs kyats. A fishing trip last for about 8 months. The dimension of the boat was about 13.5 long, 4 m wide and about 9 m high. The boat used Hino engine EH. 500. Each otter trawler had over 100 sets of net for catching fish and about 12 to 13 workers.

The fish available depended on the fishing area, the amount of fishing gears, the experience of the workers and expenditure. The earning for boat workers depended upon the weight of fish caught, and the average price of fish. The workers were given 10% of the income. In some fishing boats, not only the boat owner but also the workers could equipped the fish boat with own sets of net. The fish caught were entitled

according to the number of sets of net owned. The boat owners did not need to pay additional money to these workers.

Field survey was done to study in detail about gill nets in Kyaikkhami, about set bag nets in Mawlamyine, and about otter trawl nets in Ye areas. The owner of the bag nets and otter trawl nets had to auction for the fishing ground and paid licene fees yearly. Gill nets could be used in any fishing ground after paying licene fees to the Department of Fishery (DOF).



In Mon coastal waters, exploitation is almost entirely by traditional crafts and gears. All of the villagers earn their livelihood wholly or partially from marine and estuarine fishing. In particular, bag net fishing for a variety of fishes is the backbone of the fisheries sector in the Mon coastal regions, especially in Mawlamyine and Kyaikkhami areas. The gill nets fishing for a variety of fishes are Mawlamyine, Kyaikkhami and Zephyuthaung areas.

In the study areas, three types of fishing gears used by fishermen are bottom gill net, stationary bag net and otter trawl net target two commercially sciaenid fish (*Chrysochir aureus* and *Otolithoides pama*). Four common fishing crafts (small fishing boat, nga-paung-hlay, ye-pyan-hlay and wan-lat) have been investigated. The average catch per net fishing varied depending on the fishing months and fishing grounds although small scale of bottom gill net fishing operation was made year round.

The demersal fishes are distributed according to depth. Different species complexes may occur in the same general area but at different depths according to FAO (2005). Stromme *et al.* (1981) stated that the deep sea fishes were generally found below 100 m and includes various snappers (*Lutjanus sp.*) and groupers (*Epinephelus sp.*). Of the collected data in the study areas, two commercial sciaenid fish (*C. aureus* and *O. pama*) were found at depth less than 100 m. Therefore, the distribution of sciaenid fish species in this study followed the pattern as reported by Stromme *et al.* (1981).

CONCLUSION

The mesh size of the fishing gears varies. Out of these gears, it has been observed that severe damage the fish is caused by bag net. The mesh size of the bag net (cod-end) should be increased from 10 mm to 20 mm. So that the sand, very small fish fingerlings and other wastes should not be retained in the net, otherwise it conserves decrease in fish population by caught.

ACKNOWLEDGEMENT

I would like to thank Dr Myine Swe, Principal of Taunggoke Degree College for his kind permission and for providing all the facilities whenever necessary to carry out this research work. I also express my gratitude to Dr Khin Myint Zin, Professor and Head of Department of Zoology, Taunggoke Degree College, for her valuable advices and encouragement for this paper. My special thanks are also due to the professional fishermen who gave full support and patience for the completion of the work and Department of fishery staffs of Mon State.

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Observation on Some Commercial Ichthyological Fauna from Thanlwin River mouth

Than Than Htay ¹

Abstract

Observation on some commercial fish fauna were conducted in three study sites of Thanlwin River mouth. The study period lasted for seven months from June 2012 to December 2012. A total of 41 fish species of 38 genera belonging to 27 families under 10 orders were recorded in the study area. Among the collected fish species, nineteen species were exported to other areas and foreign countries. Out of nineteen exported species, eight species were 'top' ten exported marine species. The economic position of recorded species were distinguished as highly commercial, commercial and minor in commercial. The types of fishing gears and their target species were also observed.

Key words: Top ten exported marine fish, role of economic importance of fish, fishing gear

Introduction

The rivers in Myanmar are very important for the inland fisheries because of the fertility of the soil with the catchments area of rivers which is a crucial factor in the ecology for the abundance of aquatic fauna and flora. The inland fisheries are mainly situated on the riverine system of the country. The main rivers in Myanmar are Ayeyarwady, Chindwin, Sittaung and Thanlwin (DOF, 2011).

Myanmar has rich freshwater and brackish water fishing areas in the coastal and extensive big river systems including Thanlwin River (DOF, 2007).

The fishery sector plays an important role in contributing social and economic development of Myanmar, especially for substantial increase in the fish supply for domestic consumption and for export. Fish resources are generally marketed fresh or frozen, processed into fish paste or dried (DOF, 2007).

Thanlwin River mouth lies off the north central part of the Gulf of Martaban (Mottama) coastline, between 15° 00' to 16° 30' N Lat. and Long. 97° 21' to 97° 36' E. Thanlwin River is one of the longest river in Myanmar and the highest amount of fish fauna is produced from this river (Stromme *et al.* 1981).

A fishing implement is the equipment with which aquatic resources are captured. Gear is also used in harvesting organisms. Moreover, the same gear can be used in various ways. The gear selection which may vary in respect of season, water body and types of fish. The gear efficiencies are based on certain established principle (Islam *et al.*, 2013).

Therefore, various kinds of fishes had been observed in abundance and most of the fish caught contributed as the major component in the commercial products of the study areas. The present study focused on commercial important of some fish fauna in Thanlwin River mouth was conducted by the following objectives: –

- to classify commercially important fish species in the study area
- to observe the types of fishing gears and their related target fish species.

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Material and Methods

Study area and study sites

Thanlwin River mouth ranged from Mawlamyine (Lat. 16° 21' – 16° 37' N, Long. 97° 37' – 97° 44' E) to Mudon (Lat. 15° 55' – 16° 25' N, Long. 97° 35' – 97° 63' E) was chosen as study area (Fig. 1).

Three study sites such as Kyauk-tan, Ka-don-paw and Ka-mar-wet were chosen in Thanlwin River mouth.

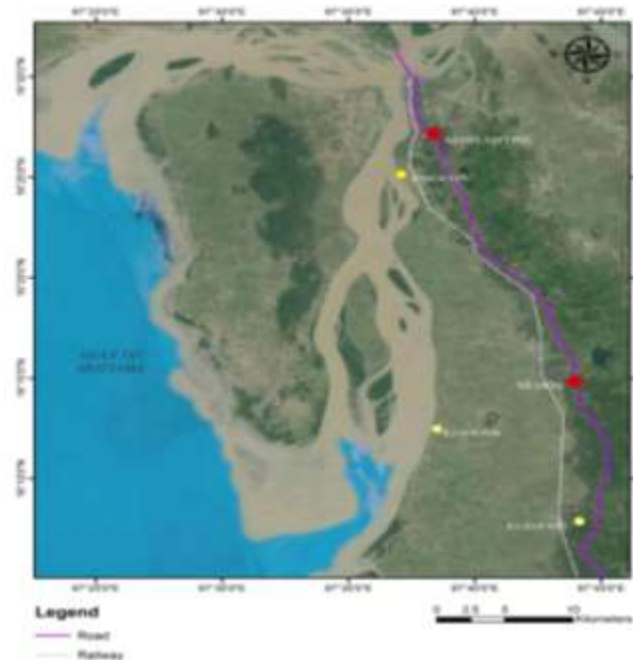


Fig. 1 Map of Thanlwin River mouth (Source: Google Earth, 2012)

Study period

Study period lasted from June 2012 to December 2012.

Specimen collection and identification of fish species

Specimen were collected from the markets and local fishermen. The photographs were taken prior to preservation in 10 % formalin for further identification. Identification keys and other morphological characteristics were applied according to Talwar and Jhingran (1991), Rainboth (1996) and Nelson (2006).

Top "ten" exported fish species were defined according to Sann Aung (2003). The species were (1) Hilsal/Nga tha lauk (2) Pomfret/Nga moke (3) Tongue sole/nga khway sha (4) Yellow croaker/Thin war (5) Ribbonfish/Nga da gon (6) Threadfin/ka ku yan (7) Croaker/Pote tin (8) Mackerel/Nga kun shut (9) Fillet and (10) Assorted marine fishes/ Nga myo zone.

Commercial value of fish species

The commercial value of each species was also recorded by direct interview survey with the local fish sellers and Department of Fishery, Mon State. Moreover, according to Sann Aung (2003) and

Indicative Price of Export Fish and Fishery Products (2010-2011), and Fish Inspection Quality Control Division, Department of Fisheries, the role of economic importance of fishes were recorded.

Utilization of fishing gears

In the study area, the utilized fishing gears were recorded with target species by direct observation and interview survey.

Results

Species composition of fishes in the study area

A total of 41 fish species belonging to 38 genera of 27 families under 10 orders were collected. The highest number of species was recorded in order Perciformes (21 species, 51 %) followed by Siluriformes (8 species, 20 %) and the least number of species in order Osteoglossiformes, Elopiformes, Aulopiformes, Cyprinodontiformes, Scorpaeniformes and Pleuronectiformes with only one species (2 %) each in the order (Fig.2).

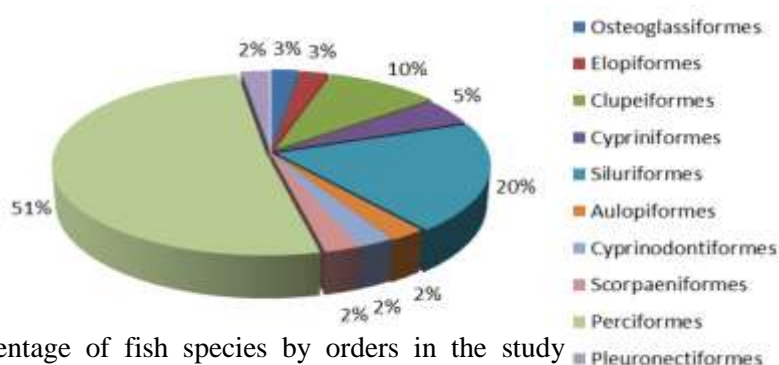


Fig. 2 Species composition (% of total) of the fishes in the study area

Commercial importance of recorded fish species

Among the collected 41 species, nineteen species were listed as economically important and exported to other areas and foreign countries. Moreover, of nineteen species, eight-species were listed as 'top' ten exported of marine species. These eight species were *Tenualosa ilisha* (Nga-tha-lauk), *Lates calcarifer* (Ka-ka-dit), *Scomberomorus guttatus* (Nga-kun-shut), *Eleutheronema tetradactylum* (Nga-tha-yaw), *Leptomelanosoma indicum* (Ka-khu-yan), *Trichiurus lepturus* (Nga-da-gon), *Pampus argenteus* (Nga-mote-phyu) and *Cynoglossus lingua* (Nga-khway-shar)

The role of economic importance of recorded fish species

The roles of economic important fish species were distinguished as three categories such as highly commercial, commercial and minor in commercial. In sampling, 17 species (51%) of highly commercial, 21 species (42%) of commercial and three species (7%) of minor in commercial values were described in Fig.3.

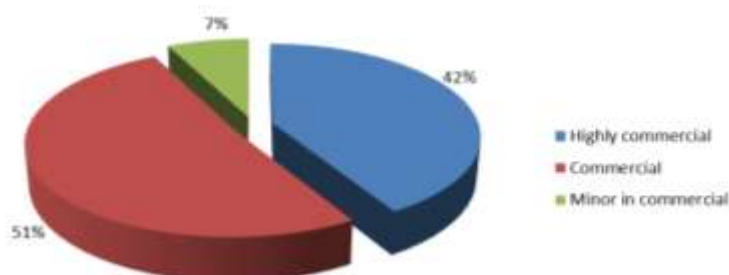


Fig. 3 Percentage composition of commercial fish species under three categories

Fish and fishery products

Fishes could be utilized as food in many ways such as fresh state, dried salted, smoked, fish paste, fish sauce and fried swim-bladder. Economic aspect of fishery products from the study area was also described (Fig.4). Most of collect fish were marketed in fresh state.

From these collecting areas, economically important fish species of 22 species can be produced as salted dried fishes. Eleven species were processed for fish paste and six species were processed for salted fish in the selected study area.

The swim-bladders of the three species namely *Arius spp.*, *Leptomelanosoma indicum* and *Otolithiodes pama* were processed for dried in the study area. All the fish species caught in this study area have their significant commercial values.

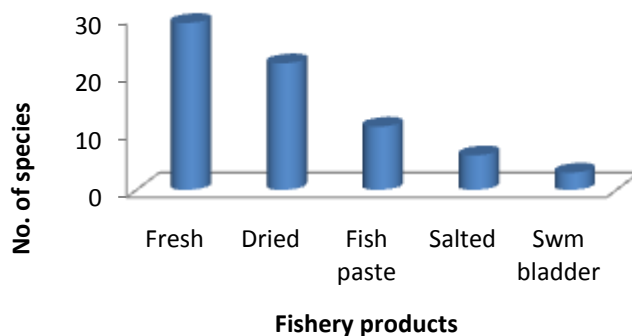


Fig. 4 Numbers of species in the economic aspect of fishery products in the study area

Fishing gears utilization in the study area

Five kinds of fishing gears such as Nga tha lauk pike, Bottom set gillnet, Beg net, Fence net and Hook and line were recorded in the study area. Different fishing gears were used to catch different target species based on the condition of the fishing habits. The fishing gears and their related target species were described in Table 1.

Table 1 Types of fishing gear and target fish species of the three study sites

Sr.No	Type of fishing gear	Fishing month	Target species
1	Nga tha lauk pike	Sept. to Nov.	<i>Tneualosa ilisha</i>
2	Bottom set gillnet	Aug. to March	<i>Leptomelanosoma indicum</i> , <i>Polymemus paradiseus</i> , <i>Arius spp.</i>
3	Bag net (Tiger mouth net)	Jan to Dec.	Miscellaneous
4	Fence net (Kan wein pike)	Jan. to Dec.	Miscellaneous
5	Hook and line	May to Sept.	Miscellaneous

Discussion

Fishing also plays as a significant role in the economy of the Thanlwin River mouth. The survey of commercially important fish species in this area was carried out from June, 2012 to December, 2012.

During the study periods, a total 41 species of 38 genera belonging to 27 families under 10 orders could be recorded and identified.

In the present study, the highest numbers of 21 species were recorded for order Perciformes. It could be assumed that the species of order Perciformes were the common one in the study area. The present finding agreed Ni Ni Lwin (1995) and Su Su Hlaing (2010) who stated that the highest number of species was recorded in order Perciformes.

Among the recorded fishes, most of the species were used for local consumption. Out of the total recorded species, 19 species were listed as economically exported to other areas and foreign countries as noted by local fishermen and Department of Fishery, Mon State. Moreover, of 19 species, eight species were listed as “top” ten exported of marine species. This finding agreed with Sann Aung (2003).

The role of economic importance was distinguished as three categories: highly commercial, commercial and minor in commercial. Seventeen species were highly commercial, 21 species were commercial and three species were minor in commercial. Distinguishing was followed by Sann Aung (2003), Hla Win *et. al.*, (2008) and base upon local demand and also Inductive Price of Export Fish and Fishery Products (2010-2011), Fish Inspection Quality Control Division, Department of Fisheries.

In the present study, fishes could be eaten as food in various ways such as dried, salted, pasted, dried swim bladder and fresh state. According to department of Fishery, fish could be utilized as food in many ways: fresh state, dried, swim bladder etc. for locally and also export to many other countries to earn foreign currency.

The production of swim bladder is one of the most important articles and also fetch high price. In the study area, there are three species of swim bladder such as *Arius spp.*, *Leptomelonosoma indicum* and *Otolithiodes pama* were recorded. *O. pama* is not popular for the taste, but their dried swim bladder are valuable for the fishing products. Fourteen species of dried swim bladder were recorded from Thanbyuzayat Township, Mon State (Yee Yee Win, 1997).

Five kinds of fishing gears were recorded in the study area. The different kinds of fishing gears have different functional properties. Fishing gear is the link between the fishermen and the fish. The fishermen select the gear, they used on the target species and habits (Hovgard and Lassen, 2000).

Fish species are abundant major commercial important in the study area. *Hilia* has occupied a very important position in local consumption as well as in export market.

Nowadays, *Tenualosa ilisha* and *Otolithiodes pama* were also gradually decreased in size and declined in catch weight of fish year by year. This is because of environmental degradation, utilization of small mesh size and human impacts, etc.

Therefore, it is important to have public awareness and educational talk concerning sustainable use of natural resources because it is the usual requirement of natural resources for every human and to improve the socio-economic development.

Conclusion

The present study was study was focused on commercial important of some fish fauna in Thanlwin River mouth. Thanlwin River mouth is not only varieties of inland and marine fish fauna but also a distinctive inland fisheries areas. Fish resources are generally marketed fresh or frozen, processed into fish paste or dried. Various types of fishing gears are operated in Thanlwin River mouth.

Nowadays, the commercial fish of *Lates calcarifer*, *Tenualosa ilisha* and *Otolithoides pama* were more declined from year after year because of physical conditions, climate changes, utilization of small mesh size and human impacts, etc.

Therefore, it is important to have well- management program and public awareness concerning sustainable use of fish fauna for generation.

Acknowledgements

I wish to express my sincere thanks to Dr Myint Shwe, Principal, Taunggoke Degree Collage, for his permission to do the present research. I would like to express my profound gratitude to Professor Dr Khin Myint Zin, Head of Zoology Department, for her constant encouragement and permission to conduct this research.

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Study on the characteristics of some Myanmar chicken breeds, *Gallus* spp. in the vicinity of Yangon, Myanmar

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Moe Moe Kyaw⁷

Abstract

This research paper is about Myanmar chicken breeds chosen from four study sites in Yangon Region conducted from 27th June to 30th June, 2014. External characters of the recorded chicken were noted as comb type, ear lobe, shank color and sex determinations followed by Jull, 1975. A total weight of individual birds was also recorded. Interview questions were done by local chicken owners. According to the data, pea comb type of the head regions, brown color of the eyes and white color of the ear lobes were mostly recorded. And then, average body weight of both males and females slightly varied in all study sites. Four utilization patterns studied in domestic chicken were food, fancy, sales of market and sports or games. The findings of the present paper were discussed especially on the aspects of poultry managements.

Keywords: Sex determination, utilization patterns, poultry managements

Introduction

Man success on earth is attributable largely to animals that have fed, clothed, and carried him and cultivated his fields. Animal agriculture utilized biological process to produce animal products useful to man. Historically, the great livestock countries of the world have supported the most advanced civilizations and have been the most powerful (Campbell, 1977).

The domestication of animals that serve mankind is about 10 thousand years old. Although there have been “growing pains” through the years, with each succeeding step in his advancing civilizations man has become more dependent upon animal and their products. Supporting successful animal production are years of experience and scientific research. Just as they do today, animals served man in early times in many ways other than as food. Animals serve mankind as subjects in experiments for medical and scientific research. In short, animals contribute greatly to both the mental and the physical health and well-being of mankind (Campbell, 1977).

The original habitat of the modern breeds of chickens is south and central India, the Himalayan Terai, Assam, Burma (Myanmar), Ceylon and throughout all the countries to the southward, on into Sumatra and Java with its string of lesser islands to the eastward. There are

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four known species of wild fowl, and they belong to the same genus called “*Gallus*” meaning a cock (Jull, 1977).

The four species are as follows: (1) *Gallus gallus* or *G. bankiva*, the Red Jungle fowl; (2) *Gallus lafayetti*, the Ceylon Jungle fowl; (3) *Gallus sonneratii*, the Grey Jungle fowl; (4) *Gallus varius*, the Javan Jungle fowl. The Javan Jungle fowl differs from the other three species in having a single- median wattle, a smooth-edged comb, truncated neck hackles, and an extra pair of rectrices, or tail feathers. The general distribution of the four species is as follows: the Red Jungle fowl is widely distributed through eastern India, Burma (Myanmar), Siam (Thai), and Sumatra; the Ceylon Jungle fowl in Ceylon; the Grey Jungle fowl in western and Southern India; the Javan Jungle fowl in Java and adjacent islands (Jull, 1975).

All four species will cross with one another, and the hybrids are more or less fertile among themselves. Also, from evidence supplied by naturalists and investigators who have crosses between each of the four wild species and domestic stocks, it appears that all hybrid progeny are fertile, with the possible exception of the female offspring of the cross between the *Gallus varius* male and domestic females. Apparently, most of the modern-day breeds are descended from these four wild species (Jull, 1975).

In Myanmar, common practice categorizes chicken development in terms of traditional, backyard, semi-commercial, commercial and industrial systems. However, industrial farming system of Myanmar chicken breeds has not been found in Myanmar. Above those reasons, the objectives of present research are:

- to record diversity of morphological characters in Myanmar chicken breeds
- to compare the poultry keepers and intention to their chickens

Materials and Methods

Study area

The study area was Yangon Region in Myanmar.

Study site

Four study sites in Yangon, were chosen as

Site I. Hmawbi Township (Northern part of Yangon)

Site II. East and South Dagon Myothit Township (Eastern part of Yangon)

Site III. Htantapin Township (Western part of Yangon)

Site IV. Kawhmu Township (Southern part of Yangon)(Fig.1)



Fig. 1 Map of the study area (Source: Land Survey Department, 2000)

Study period

The data collections were lasted from 27 to 30, June 2014.

Study design

During the study period, each study site is visited once a day. Then, the data from the only Myanmar chicken breeds which were domesticated in five villages of each study sites.

Procedures of field observations

Characteristics of external features in recorded chicken were noted as comb type, shank color, and sex determinations followed after Jull, 1975. A total weight of each bird was also recorded. Interview survey was done with chicken owners in different study sites and especially upon the purposes of their domestications. (Plate 1, 2, 3, 4, 5, 6)



Measured of Total Length



Measured of Tail Length



Measured of Eye Length



Measured of Shark Length



Measured of Body Length



Measured of Toes Length

Materials

Digital camera, plastic gloves, Digital balance, cotton bag, tape measurement and data collecting sheets were used in this study.

Results

The number of Myanmar chicken breeds in present study area

During the study period, a total of (21) in males, (30) in females and (116) in chicks were recorded. Moreover, percent composition of adult males, females and chicks were (Table 1).

Table 1. Recorded Myanmar chickens in present study

Type (or) sex	Number	Percentage
Male	21	13
Female	30	18
Chicks	116	69

Morphological characteristics of recorded chicken

(1) Head region

In all study sites, three different comb types were observed. And then, four types of eye colors and two types of ear lobe colors were also recorded. Collected data were shown in Fig.2, 3 and 4.

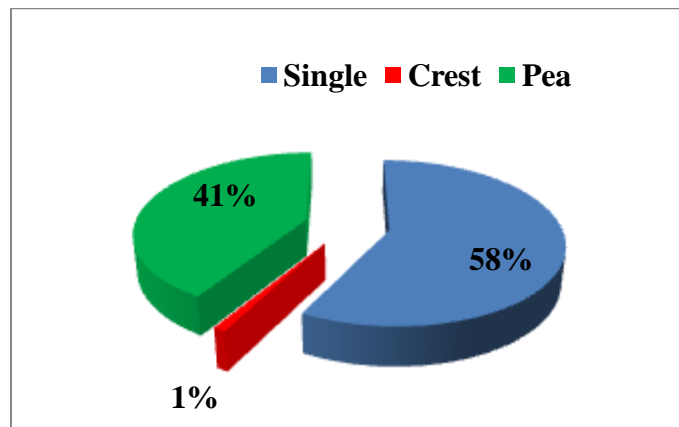


Fig. 2 Different comb types

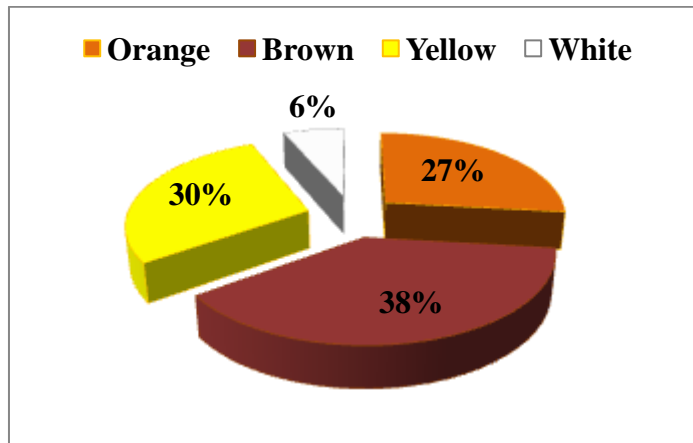


Fig. 3 Different types of eye color

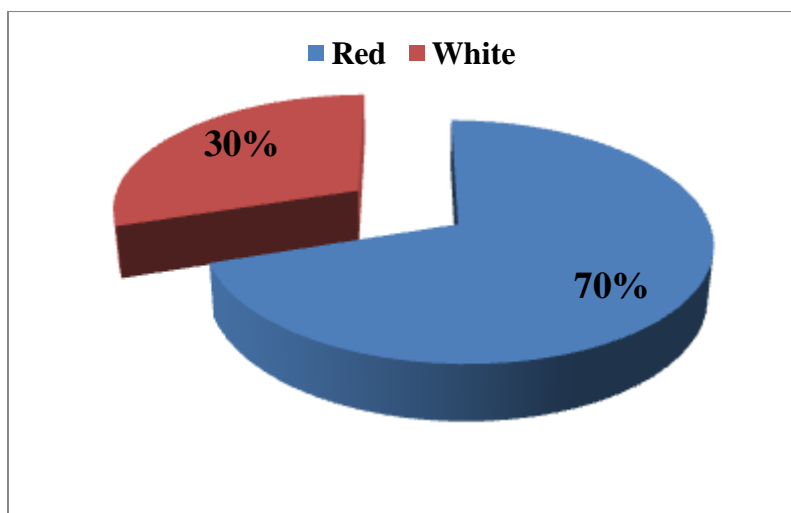


Fig. 4 Different types of ear lobe

(2) Other factors

Only the white skin color of chicken was observed in this study. The average of shank length in total recorded chicken was 7.36 cm and five colors of those shanks were also presented in (Fig.5).

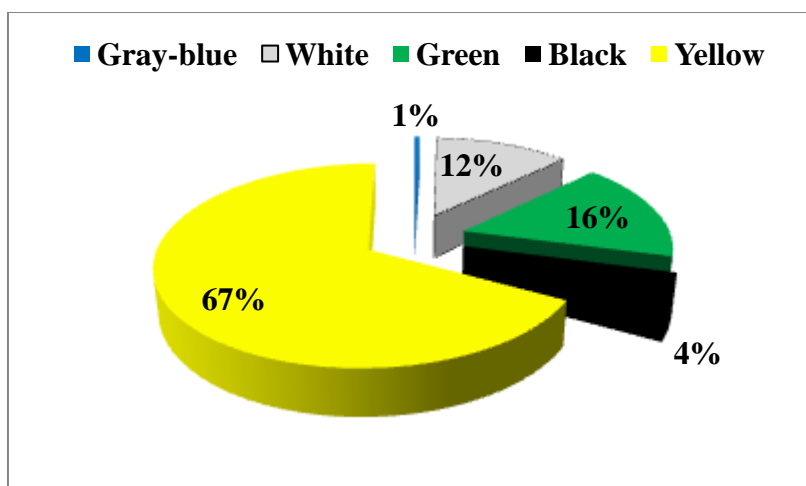


Fig.5 Different types of shank color

(3) Measuring of the Body weight

The average of male and female chicken body weight were expressed in kilograms (Fig.6).

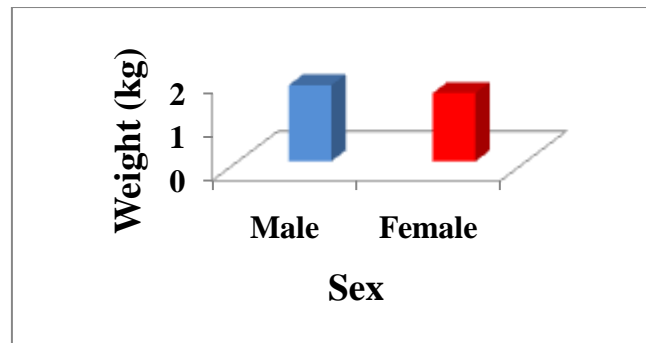


Fig. 6 Average body weight of both male and female

Feeding types for chicken in different farms

In this study, chicken were fed with broken rice and bran in usual times by their owner's family but waste products and grains to supplement the weeds and insects that are found in the backyard which was fed by their selves. It was called complete feeding and incomplete feeding (Fig.7).

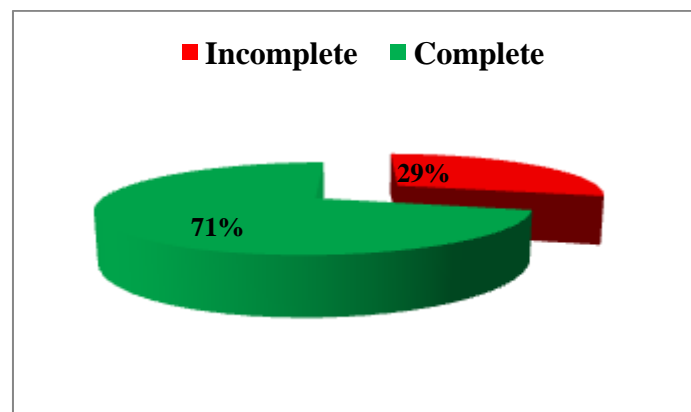


Fig. 7 Percentage of feeding types

Application of chicken house in different study sites

A total of 45 percent of chicken were used in chicken house and 55 percent were not used (Fig.8).

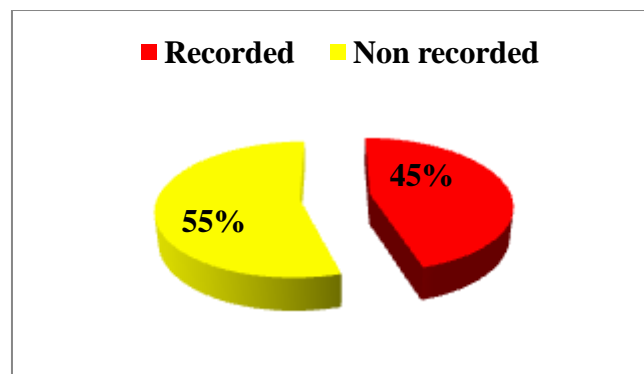


Fig. 8 Chicken house in different study sites

Utilization patterns of studied domestic chicken

According to the interview surveyed, the owners had various purposes upon their domestications. Some intended for food, some were fancy, sales of market and sports or games (Fig.9).

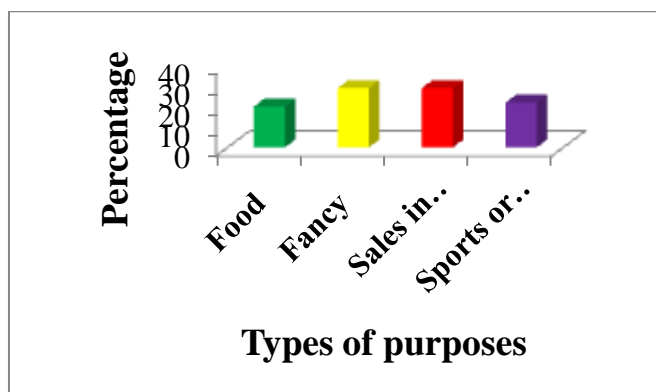


Fig. 9 Different purposes of poultry keepers

Discussion

In this study, the sex ratio of the adult chicken was 2:3 in males and females. According to Jull (1975), one male per 15 to 18 females (1:15-18) is a good proportion. In this study, the recorded ratios of each sex were sufficient for the reproductive success and it cannot frequently be found excessive fighting among males in a large flock of females.

Variations of the comb types, ear lobes, eye colors of studied chicken were also recorded. These were probable that determining the mode of inheritance became more complicated characteristics. And then, the skin color of the recorded chicken was white only. Jull (1975) stated that Asiatic breeds' skin was yellow, except the Black Langshan whose skin was pinkish white. This may be assumed that these recorded chicken were in relation with the Black Lanshan breeds. Jull also described that all Asiatic breeds had red ear lobes, lay brown-shelled eggs, classified as broody. According to the data, the colour of ear lobes was white or yellow. It may be due to the hybrid characteristics of those chicken.

In this study, the recorded weights in adult chicken bodies were big. The breeds belonging to Asiatic class are distinctive type and have large bodies, feathered shanks and are usually heavy in bone (Jull, 1975). So, the recent findings are agreed with the above mentioned author.

Incomplete feeding was more than the usual time on feeding in domestic chicken in the four study sites. Upon the view of present data, some poultry keepers in those study sites possibly have narrow mindset. Indeed, their domestic chicken are small but they reproduce easily, they do not have large investments and they thrive on kitchen waste, broken grains, worms, snails or insects.

In present study area, non-utilization of chicken house was more observed than the utilization. The loss of 50 to 80 percent decreased mortality of young chicks is reported, e.g. the loss due to predators (Schiere and Kater, 2001). Actually, good housing overcomes the problems of predators and thieves; the tension both in the family and between neighbors can be a stepping-stone for social development programmes. Moreover, any infectious chicken were

not observed in the study period. It was assumed to be recorded that poultry farms have a healthy surrounding.

In present findings, poultry keepers were utilized their chicken as food, fancy, sale in the markets and sports or games. Among them, the middle was mostly recorded because it was probable as a social activity or betting.

Finally, some poultry keepers in the study area tend to approach the family poultry with a narrow mindset. They may focus on improved housing, and avoidance of inbreeding and good veterinary care-issues more related to the keeping of confined than scavenging chicken on free range. This research paper will be provided with some information for further studies concerned with poultry science of Myanmar chicken breeds.

In conclusion, the conservation of local genetic resources should be supported and the communities should assist to find sustainable ways to improve chicken performance including better health, feeding and husbandry. The improvement of chick rearing protein supplementation and egg production can be found in these areas.

Acknowledgements

First of all, we wish to express our gratitude to Dr Myint Swe, Principal, Taunggoke Degree College for giving us permission to carry out this research paper. We are very grateful to Professor Dr Khin Myint Zin, Head of Zoology Department, for her encouragements and kind help to do this research. Finally, we would also like to thank to Thepsatri Rajabhat University in Thailand for their support in the field trips.

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The Study of Ethnomedicinal Plants Used by of Rakhine Tribes in Taunggoke Township

Ohn Mar Kyaw⁸, Yadanar Thiri Phyu⁹, Than Than Htet¹⁰, Su Thet Yi⁴

ABSTRACT

Traditional medicine plays an important role in primary healthcare of people in treating various types of ailments in living beings. This paper deals with the observations on ethnomedicinal uses of wild plants by the Rakhine tribes of villages surrounding the Taunggoke Township Areas of Thandew District, Southern Rakhine State, Myanmar. Data were collected by interviewing Rakhine medicine men and knowledgeable people with the help of semi-structured and open-ended questionnaire. This paper describes the traditional knowledge related to ethnomedicinal knowledge and plant parts utilization for curing various ailments by Rakhine ethnic community. Total 7 plants were identified belonging to 6 families used by the Rakhine community to treat different ailments. These medicinal plants were mostly used for treatment of anemia, asthma, cough, cold, constipation, diabetes, diarrhea, diuretic, dysentery, expectorant, eye injury/ infection, fever, gout, headache, itches, laxative, rheumatism, ringworm, skin diseases, stomach problem, toothache, tumors, urinary problem, wounds and others. Leaves were mostly used (29%), fruits (18%), latex, flowers and seeds (12%) and along with whole plants, rhizome and root.

INTRODUCTION

Ethnomedicine is a study or comparison of the traditional medicine practiced by various ethnic groups, and especially by indigenous people. Ethnomedical research is interdisciplinary; in its study of traditional medicines, it applies the methods of ethnobotany and medical anthropology. Anthropological studies examine the cultural perception and context of a traditional medicine (Phillipson 1991).

Ethnomedicine has evolved over the millennia of human existence, and has ever been exhibited by dogs, cats and wild animals that eat specific grasses, roots and other parts of the plant to relieve pain, supply diet and help cure diseases. The use of plants and plants products as medicine can be traced as far back as the beginning of human civilization. The earliest record of medicinal plant used in the Himalayas is found in the Rigveda which is supposed to be the oldest repository of human knowledge and describes 67 plants. After the Rigveda, Ayurveda, describes the medicinal importance of 1200 plants (Chopra, 1958).

Often, the medicinal traditions are preserved only by oral tradition. According to the survey of World Health organization, the practitioners of traditional systems of medicine treat about 80 % of patients in India, 85 % in Myanmar and 90 % Bangladesh (WHO, 1993).

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The components of ethnomedicine have long been ignored by biomedical practitioners for various reasons. For example, the chemical composition, dosages and toxicity of the plants used in ethnomedicine are not clearly defined (WHO, 2002).

Today about 80% of the world's population rely predominantly on plant and plant extracts for healthcare. The spiritual aspects of health and sickness have been an integral component of the ethnomedicinal practice for centuries and a dimension ignored by biomedicine practitioners because of the difficulties involved in validating its success using scientific principles and experiments. Today, ethnomedical practices and beliefs are part of a total belief system that transcends class; ethnicity and religious belief in such a manner that the terms "folk or traditional" can be used to describe that are truly universal (Kannel, 1979 and King et al., 1995).

Ethnomedicine refers to the study of traditional medical practice which is concerned with the cultural interpretation of health, diseases and illness and also addresses the healthcare seeking process and healing practices (Krippner, 2003).

The practice of ethnomedicine is a complex multi-disciplinary system constituting the use of plants, the natural environment and has been the source of healing for people millennia. Research interest and activities in the area of ethnomedicine have increased tremendously in the last decade. The components of ethnomedicine have long been ignored by many biomedical practitioners for various reasons. For example, the chemical composition, dosages and toxicity of the plants used in ethnomedicine are not clearly defined (Lowe, 2000).

Some outstanding medicinal drugs which have been developed from the ethnomedicinal uses of plants include: vinblastine and vincristine from *Catharanthus roseus* L. (the periwinkle) used for treating acute lymphoma, acute leukaemias etc, Today about 80% of the world's population rely predominantly on plants and plant extracts for healthcare (Setzer, 2006).

Today, ethnomedical practices and beliefs are part of a total belief system that transcends class, ethnicity and religious belief in such a manner that the terms "folk or traditional" can be used to describe practices that are truly universal. In North America, Europe and the Caribbean, the return to the traditional ethnomedicinal aspect of healthcare is not restricted to the poor, but extends to all social classes (Lowe, 2000).

According to data released by the World Health Organization (WHO), ethnomedicine has maintained its popularity in all regions of the developing world and its use is rapidly expanding in the industrialized countries, for example, in China traditional herbal preparation account for 30–50% of the total medicinal consumption. In Ghana, Mali, Nigeria and Zambia, the first line treatment for 60% of children with malaria is the use of herbal medicine. In San Francisco, London and South Africa, 70% of people living with HIV/AIDS use traditional medicine. Today the annual global market for herbal medicine stands at over US \$60 billion (WHO, 2003).

Most of the Myanmar traditional drugs are made up from wild plants and only a few drugs that are made up from cultivars. Myanmar is rich in flora and has the ancient empirical knowledge in the indigenous plants. This social acceptance of herbal medicine among the majority of the people is due to the fact that certain plants which do have reliable curative powers. A numbers of Myanmar traditional important medicinal plants are being categorized due to the effectiveness. Therefore the study of medicinal plants and their therapeutics has played very important role in health care system of Myanmar.

This present work deals with some medicinal plants used for various ailments grown in Kin-Taung Village, Tounggoke Township, to inform the knowledge of ethnomedicinal uses of local people who live in the Taunggoke Township area and to document the development of wild medicinal plants domestication and utilization from various traditional healers of Taunggoke Township.

MATERIALS AND METHODS

Ethnomedicinal data were collected from December 2016 - September 2017, two tribal villages that were selected with the help of aged persons on basis of the availability of traditional healers. Most of the informants belong to an age between 50 and 80 years. The key informants selected from each sampled villages were the most knowledgeable ones as suggested by the tribal elders of respective villages. Before interview, Prior Informed Consent (PIC) was taken from each informant. The data have been collected by interviewing the informants through semi-structured and open-ended questionnaire. The local name of the plant, parts used, preparation and mode of administration of the crude drug, disease cured, etc. were recorded in detail. Interviews were conducted in the local languages i.e. Rakhine. The plant specimens were collected and identified with the help of different Floras (Backer, 1963; Hundley and Chit Ko Ko, 1987; Kress et al., 2003). Correct and Valid scientific names for the recorded plant species have been used here following The 8 families are arranged by APG III system (2009). Collected plant specimens have been preserved as herbarium specimen following conventional techniques and kept in Department of Botany, Taunggoke Degree College for future references. During field trips, the digital photographs and specimens were collected. The results are shown in Table (1) List of the plant use for local people of Taunggoke Township areas, Table (2) Main Plant Groups Used in Medicinal Purpose in Study Area, Table (3) Habit of Medicine plant in Study Areas.

RESULTS

Scientific Name	- <i>Alpinia conchigera</i> Griff. Nat.PL.Asiat.3:424.1851 I
Family	- Zingiberaceae
Common Name	- Greater galangal
Local Name	- Padegaw-gyi
Local Name	- Padegaw
Part used	- Rhizomes

Outstanding features

Perennial, Rhizome cylindrical, stout, aromatic, covered with scales. Leaves alternate, lanceolate, lower part surrounding the stem, the upper face glabrous and shining. Inflorescences terminal, dense raceme, long. Flowers white, lip veined with red. Fruits globose or ovoid.

Flowering period - May - September.

Distribution - Grows wild in the mountains and is cultivated everywhere.

Uses – The rhizome is used in the treatment of malaria fever, in a daily dose of 3 to 6g in the form of a decoction powder.



(a) Habit

(b) Rhizomes

(c) Pieces of rhizomes

(d) Decoction of pot

Figure 1. *Alpinia conchigera* Griff.

Scientific Name	- <i>Carica papaya</i> Linn.Sp .PL. 2:1036 .1753 [1 May 1753] (IK)
Family	- Caricaceae
Common Name	- Papaya
Myanmar Name	- Thinbaw
Local Name	- Pa-da-kar
Part used	- Leaves

Outstanding features

A small tree or herbaceous often with an unbranched trunk and a terminal cluster of leaves, lactiferous. Leaves alternate, palmately lobed, latex present. Flower unisexual (monoecious or dioecious). Inflorescence axillary or solitary. Male flower sessile, pendulous panicles, calyx small, connate at base, 5 lobed, corolla light yellow, stamens 10, alternate to corolla lobed. Female flower solitary, short pedicelled, corolla tube very short, style short, 5 stigma, fan shape, short corolla tube, ovary ovoid, many ovules. Fruit berries, ellipsoid, orange yellow when ripe. Seeds many, black, globose, testa fleshy.

Flowering period - January -April

Distribution - Cultivated widely.

Uses - The leaves is dried and made powder. It was use as a tea once a day to treat diabetes.



(a) Habit



(b) Flowers



(c) Motor of leaves



(d) Decoction of leaves

Figure 2. Medicinal uses of *Carica papaya* Linn.

Scientific Name	- <i>Catharanthus roseus</i> (L.) G .Don Gen .Hist .4 (1):95. 1837(IK)
Family	- Apocynaceae
Common Name	- Periwinkle
Myanmar Name	- Thinbaw-ma-hnyo
Local Name	- Thinbaw-ma-hnyo
Part used	- Leaves

Outstanding features

Perennial herb, stems pinkish-red, much branched. Leaves opposite, obovate, glabrous on both sides, dark shining above. The Inflorescences are terminal. The flower are white to dark pink with a darker red centre, with a basal tube, long, erect, corolla tube cylindrical, glabrous, filament very short, ovary superior, 2 carpels, style slender, stigma glabrous. Fruit composed of 2 free cylindrical follicles, narrow, slightly arched-recurved in pairs. Seeds are numerous, tiny blackish brown.

Flowering period - May-October

Distribution - Common wild plant and cultivated as an ornamental plant.

Uses - The leaves are useful in treating diabetes mellitus, in a daily dose of 4 to 8g as a decoction or liquid extract.



(a) Habit

(b) Inflorescences

(c) Powder of leaves

(d) Decoction of leaves

Figure 3. *Catharanthus roseus* (L.)

Scientific Name	- <i>Dillenia indica</i> L. Sp.Pl.1:535.1753 [1 May 1753]IK
Family	- Dilleniaceae
Common Name	- Elephant apple
Myanmar Name	- Tha byu
Local Name	- Tha byu
Part used	- Leaves

Outstanding features

Medium sized evergreen trees, bark is reddish brown in colour, young branchlets is brown pubescent, contain leaf scars. Leaves are fasciculate at the ends of branches, petiole is narrowly winged, channeled, sheathing, leaf blade oblong. Inflorescence terminal and solitary cymes. Flowers are solitary cymes, large, white, 5 merous, sepals 5, orbicular, concave, thickly and fleshy, petals 5, white, obovate, stamens many, ovary superior, carpels 16-20 in number. Fruits are aggregate and globose, indehiscent, persistent sepals. Seeds compressed, embedded in glutinous pulp with hairy margins.

Flowering period	- May - June.
Distribution	- Grows wild.
Uses	- The decoction of the leaves are used to treat diabetes.



(a) Habit

(b) Fruit and leaves

(c) Boiling in the pot

Figure 4. Medicinal uses of *Dillenia indica* L.

Scientific Name	- Piper betel Blanco. FI .Filip .[F .M .Blanco]22 .1837 (IK)
Family	- Piperaceae
English Name	- Betel vine
Myanmar name	- Kun
Local Name	- Kun
Part used	- Leaves
Uses	- Chew 4 leaves with a bulb of <i>Allium sativum</i> L. for malaria.

Outstanding features

A slender creeper with adventitious roots. Stems glabrous, sulcate, thickened at the nodes. Leaves alternate, heart-shaped, palmately nerved, glabrous and shining on both sides. Inflorescence in drooping, dense axillary spike, consisting of male and female flower. Berry globose, hairy at the apex (rarely produced). All parts of the plant have a special aroma.

Flowering period - May- August

Distribution - Cultivated in many areas, especially in the South for its leaves, which are chewed.



(a) Habit



(b) Leaves



(c) Bulbs of Allium sativum L.

Figure 5. Medicinal uses of Piper betel Blanco.

Scientific Name	- Piper nigrum L . Sp .Pl .1: 28 .1753 [1 May 1753] IK
Family	- Piperaceae
Common Name	- Black pepper
Local Name	- Nga-yoke -kaung
Part used	- Seeds

Outstanding features

Climbing perennial herbs. Stems glabrous, rooting at the nodes. Leaves alternate, rounded at the base, apex pointed, recurved nerves prominent beneath. Inflorescence in drooping spike of dioecious flower, opposite and shorter than the leaf. Berry glabrous, red when ripe, turning black after drying, strongly scented and bitter to the taste.

Flowering period - May-August

Distribution - Extensively cultivated.

Uses - Boil seeds with bulbs of Allium sativum L. and leaves of Azadirachta indica and drink decoction two times daily.



(a) Habit



(b) Seeds



(c) Drying Seeds

Figure 6. Medicinal uses of Piper nigrum L.

Scientific Name - *Solanum nigrum* (L.) Sp.PL. 1:186.1753 [1 May 1753] (IK)

Family - Solanaceae

Common Name - Kaju

Local Name - Kazaw-kha

Part used - Fruit

Outstanding features

Perennial herb, much branched, prickles many, large, sharp, the bases compressed, often recurved. Leaves alternate, simple, prickly, laminae ovate, the tips subacute, the bases cordate, surface pubescent. Inflorescences in extra axillary cymes, many flowered, bract not found. Flower bisexual, actinomorphic, 5 merous, calyx synsepalous, 5 – lobed, triangular, persistent, corolla synpetalous, 5-lobed, rotate, stamen - 5, blue, epipetalous, the filament very short, anthers dithecal by apical pore, ovary superior, 2-carpelled, syncarpous, 2 - locule, the ovules many in each locule, axile placentation, style pubescent, stigma capitate. Fruit berry, globose, glabrous, dark yellow when ripe. Seeds subdiscoid, much compressed, endosperm fleshy.

Flowering period - Throughout the year

Distribution - Throughout the tropical regions of Myanmar.

Uses- The fruit are used to treat for diabetes.



(a) Habit

(b) Inflorescence

(c) Ripe Fruits

Figure 7. Medicinal uses of *Solanum nigrum* L.

Table (1) List of the plant use for local people of Taunggoke Township area

Sr. No	Scientific name	Family	Vernacular name	Part used	Form of preparation
1.	<i>Alpinia conchigera</i> Griff. Nat.PL. Asiat.3:424.1851. IK	Zingiberaceae	Padegaw-gyi	Rhizome	Decoction
2.	<i>Carica papaya</i> Linn Sp.Pl. 2:1036. 1753[1 May1753](IK)	Caricaceae	Thinbaw	Leaves	Tea
3.	<i>Catharathus roseous</i> (L.) G .Don Gen.Hist. 4(1) : 95. 1837 (IK)	Apocynaceae	Thinbaw – ma –hnyo	Leaves	Decoction / Liquid extract
4.	<i>Dillenia indica</i> L. Sp.Pl. 1:535. 1753 [1May 1753] IK	Dilleniaceae	Thabyu	Leaves	Decoction
6.	<i>Piper betel</i> Blanco FL. Filip. [F.M Blanco] 22.1837(IK)	Piperaceae	Kun	Leaves	Chew(Eaten)
5.	<i>Piper nigrum</i> L. Sp.Pl. 1:28. 1753[1May 1753] IK	Piperaceae	Nga-yoke -kaung	Seeds	Decoction
7.	<i>Solanum nigrum</i> L.Sp. Pl. 1:186. 1753 [1 May 1753] IK	Solanaceae	Kazaw-kha	Fruit	Eaten

Table (2) Habit of Medicine plant in Study Area

No.	Habit	Number of Species	%
1.	Tree	1	14%
2.	Shrubs	3	43%
3.	Herb	1	14%
4.	Vine/ Climber	2	29%
	Total	7	100%

Table (3) Main Plant Groups Used in Medicinal Purpose in Study Area

Plants Group	Number of species	
	Number	%
Dicotyledons	6	86%
Monocotyledons	1	14%
Total	7	100%

CONCLUSION

This study will help in preparation of ethnomedicinal database. The use of quantitative tools is very new approach here in analysis of Rakhine medicine from Southern Rakhine State. The high consensus obtained from the healers who underlines their well-defined herbal tradition and could guide in selection of medicinal plants and natural product studies. The traditional knowledge of herbal medicine was practiced among the Rakhine community of the villages surrounding the Taunggoke Township of Thandwe District that should be conserved through its documentation before it is lost from the respective Rakhine societies forever. It will also protect the Rakhine community of the study area. We recommend for training the health care units in tribal areas on knowledge of ethnomedicine for various treatments in case of emergency as a first aid to save lives if necessary. The herbal claim of this study has to be exploited further for developing new cost effective herbal drug.

Acknowledgements

We are very much grateful to the local community and particularly the respondents of Rakhine informants who shared their knowledge regarding in the use of medicinal plants with us, freely offered crucial information needed for this study. We are grateful to Dr. Myint Swe, Principal, Taunggoke Degree College for the use of research facilities related to the research work. We are also thankful to Dr. Ohn Maung, Professor and Head, Taunggoke Degree College for his invaluable guidance, continuous advice and for providing information and reference book. We also give our thanks to all of our teachers from whom we have learnt since our childhood and to all our colleagues for their valuable assistance.

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STUDY ON SOME MEDICINAL PLANTS GROWN IN TAUNGGOKE DEGREE COLLEGE CAMPUS

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ABSTRACT

In this paper, some medicinal plants grown in Taunggoke Degree College Campus were studied and recorded with color photographs. A total of 10 species belong to 10 genera of 9 families were collected, identified and described with Family, Scientific Name, Myanmar Name, English Name, Flowering Period, Morphological Characters, Part Used and Literature Used.

Key words: Medicinal plants, morphological characters, part used, identified

INTRODUCTION

The study area. Taunggoke Degree College Campus is situated between 18.52'25.577"N and 18.52'56.165"N latitude and between 94.13'19.817"E and 94.14'25.725"E longitude. The total studied area is 212.20 acres.

Human beings mainly depend on plants for food and also for medicine. Most of the drugs are obtained from wild plants growing in all parts of the world, especially in tropical regions (Lawrence, 1964).

Medicinal plants are great importance for health care. They are used as raw materials for the extraction of active constituents in pure form as precursors for synthetic vitamins and steroids and as preparation for herbal and indigenous medicines. Plants are not only the major source of energy- rich food in most societies, but also an indispensable source of vitamins and other substances promoting healthy growth.

Health is the main important factor for human beings. Human search plants and their parts that could be relieved their illness from his early history to present time. Health is the level of functional and metabolic efficiency of a living organism. In human, it is the ability of individuals or communities to adapt and self- manage.

World Health Organization defined health in it's broader sense in it's 1948 constitution as a stable of complete physical, mental, and social well-being and not merely the absence of disease or infirmity.

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In 1984, World Health Organization revised definition of health defined as ‘‘the extent to which an individual or group is able to realize aspirations and satisfy needs, and to change or cope with the environment. Health is a resource for everyday life, not the objective of living; it is a positive concept, emphasizing social and personal resources, as well as physical capacities (World Health Organization, 2000).

Today, Myanmar Government has been giving encouragement and flourishing of the highly valued traditional medicine by holding conferences on traditional medicine yearly, showing that the best and exact period for the emergence of traditional medicine.

The aim of this paper is to study the morphological characters, to get the information about the medicinal plants, , to identify the reputed indigenous plants grown in Taunggoke Degree College Campus.

MATERIALS AND METHODS

The specimens were collected from Taunggoke Degree College Campus during July 2017 to July 2018. The collected specimens were studied and identified in the Department of Botany, Taunggoke Degree College with the help of literature such as Hooker (1875-1885), Backer (1963-1968) and Dassanayake (1980-2001). The collected specimens were recorded by colored photographs while flowering. Medicinal uses of these plants were studied by the literature of Lemmens *et. al* (2003), Padua *et. al* (1999), Ministry of Health (2003), Mohamad (2002), Prajapati *et. al*, (2003), Valkenburg *et.al*, (2002) and World Health Organization (1998).

RESULTS

1. Scientific Name - *Catharanthus roseus* (L.) G. Don, Gen. Hist. 4:95. 1837.

Family - Apocynaceae

Myanmar Name - Thinbaw manyo

English Name - Madagascar Periwinkle

Flowering Period - Nearly throughout the year

Morphological Characters

Annual or perennial procumbent herbs or undershrubs with watery juice; stems and branches reddish brown, glabrous. Leaves simple, opposite and decussate, exstipulate; blades elliptic- obovate, cuneate at the base, entire along the margin, rounded or acute at the apex, glabrous on both surfaces. Inflorescences axillary solitary or geminate cymes. Flowers bisexual, actinomorphic, pentamerous, hypogynous, purple, pink or white. Calyx 5-lobed. Corolla 5-lobed, salverform. Stamens 5, free, included ; filaments short; anthers dithecal, basifixed. Ovaries two, superior, oblongoid, two large glands of disk present, unilocular, many ovules in the locule on the parietal placentae; style filiform; stigma annulate, viscid. Fruits follicular, pairwise. Seeds many.

Part Used - The whole plant, roots and leaves

Literature Used - Malays are believed to have taken a decoction of this plant to treat diabetes, hypertension, dysentery, enteritis, menstrual pains, insomnia and cancer .The roots and

leaves are useful in hypertension, purified alkaloid, leukaemia and the roots are used to induce cerebrovascular dilatation and for hypertension

(Mohamad, 2002 & Prajapati *et. al*, 2003).

Specimen Examined - Taunggoke Township, Taunggoke Degree College Campus, Khin Moe Moe Khine and Than Than Htet, July 19, 2017, Coll. No. 2

2. Scientific Name - *Eclipta prostrata* L., Mant. 2:286. 1771.

Family - Asteraceae

Myanmar Name - Kyeik hman

English Name - Trailing Eclipta

Flowering Period - May to October

Morphological Characters

Perennial erect herbs; stem solid, reddish, appressed pilose. Leaves simple, opposite and decussate, exstipulate; blades elliptic-lanceolate, obtuse at the base, slightly undulate along the margin, acute at the apex, appressed pubescent on both surfaces; sessile. Inflorescences terminal solitary heterogamous head.. Involucre campanulate, involucre bracts two series, elliptic, appressed pubescent; receptacle flat; paleaceous linear, bristle-like. Ray florets numerous, white, zygomorphic; ligules 2-lobed, white; tube short, hairy at the apex. Disc florets 10-15, white. Stamens 4, epipetalous, inserted; filaments filiform; anthers syngenesious; pappus 2, scaly; style filiform; stylar arms clavate. Fruits achenes, pubescent at the tip.

Part Used - The whole plant

Literature Used - The plant is used in anti-inflammatory, carminative, diuretic, digestive, hypertension, jaundice, good for blackening and strengthening of the hair (Prajapati *et al*. 2003).

Specimen Examined – Taunggoke Degree College Campus, Khin Moe Moe Khine and Than Than Htet, July 20, 2017, Coll. No. 12.

3. Scientific Name - *Eupatorium odoratum* L., Syst. 10: 1205. 1759.

Family - Asteraceae

Myanmar Name - Bezat

English Name - Bitter bush

Flowering Period - November to March

Morphological Characters

Perennial shrubs; stems solid, cylindrical, pubescent. Leaves simple, opposite and decussate, exstipulate; blades deltoid, cuneate at the base, dentate along the margin, hairy on both surfaces, gland dotted; petioles slender, pubescent. Inflorescences terminal or axillary homogamous, disciform; involucre bracts 3 to 5 seriate, scarious with green striate, glabrous; receptacle convex, naked. Disc florets 20-35, bisexual; pappus 1-seriate, filiform, unequal in length, grayish white, spinulose. Corolla funnel-shaped, with 5 dentate lobed. Stamens 5, exserted; filaments filiform; anther dithecal, oblong, obtuse at the base, glabrous. Carpels 2, fused; ovary inferior, unilocular, elliptic-lanceolate, 5-angled, pubescent; style cylindrical, glabrous; stylar arms

2, linear, obtuse at the apex. Fruits achene 5-angled, elliptic-lanceolate, brown, crowned with the pappus hairs.

Part Used - Leaves

Literature Used - In Indonesia, the young leaves are crushed and the resulting liquid can be used to treat skin wounds, used as tea to break up the common cold and for intermittent fever and influenza (Mohamad, 2002).

Specimen Examined - Taunggoke Degree College, Khin Moe Moe Khine and Than Than Htet, February 10, 2018, Coll. No. 30.

4. Scientific Name - *Heliotropium indicum* L., Sp. Pl. 130. 1753.

Family - Boraginaceae

Myanmar Name - Sin hna maung gyi

English Name - Indian heliotrope

Flowering Period - April to September

Morphological Characters

Annual, erect or diffuse herbs; stems terete, fleshy, hirsute. Leaves simple, alternate at the upper and opposite at the lower portion, exstipulate; petioles winged, indistinct; blades ovate, rounded to obtuse and long attenuate at the base, undulate along the margin, acute at the apex, sparsely pubescent on both surfaces. Inflorescences terminal or axillary scorpioid cymes. Flowers bisexual, actinomorphic, pentamerous white or pale purple. orange at the throat of corolla tube,

Calyx 5-lobed, campanulate. Corolla 5-lobed, salverform;.. Stamens 5, free, included, adnate above the base of corolla tube; filaments short; anthers dithecal, oblong. Carpels 2, fused, ovary superior, bilocular, 4-ovules in each locule on the axile placentae; style terminal stout; stigma conical. Fruits deeply 4-lobed, angular.

Part Used - The whole plant

Literature Used - The whole plant is used as oliguria, haematuria as anti-inflammatory agent and oedema due to renal disease (Mohamad, 2002).

Specimen Examined - Taunggoke Degree College Campus, Khin Moe Moe Khine and San San Aye, May 28, 2018, Coll. No. 20.

5. Scientific Name - *Momordica charantia* L., Sp. Pl. 1009. 1753.

Family - Cucurbitaceae

Myanmar Name - Kyet hin khar

English Name - Bitter gourd; Carilla fruit

Flowering Period - July to December

Morphological Characters

Annual, monoecious, tendrillar climbing herbs; stems and branches obtusely 4- to 5-angled, pubescent. Leaves simple, alternate, exstipulate; blades orbicular, deeply 5-7 lobed, cordate at the base, coarsely dentate along the margin, acute at the apex, glabrous or sparsely pubescent. Inflorescences axillary and solitary in pistillate, subraceme in staminate flowers.

Flowers unisexual, actinomorphic, hypogynous, yellow. Calyx 5-lobed, campanulate. Corolla 5-lobed, rotate- campanulate, Stamens 3, free, included; filaments short; anthers ditheous, one of them monothecous, conduplicate; stamodes 3 to 5, scale-like, inside the calyx tube, absent in pistillate flowers. Ovary inferior, muricate, unilocular, many ovules in the locule on the parietal placentae; style slender, thickened; stigmas 3, pistillode absent in staminate flowers. Fruits oblong-fusiform, longitudinal ribbed, tubercles between ridges. Seeds many.

Part Used - Fruits

Literature Used - In Philippines, the fruits are macerated in oil, is used as a vulnerary. It is used to treat fever, leprosy, malignant ulcers, hypertension, dysentery and diabetes. In Pacific, the fruits are used to treat leprosy, malignant ulcers, stomach worms, fever, hypertension, dysentery and diabetes (Mohamad, 2002).

Specimen Examined - Taunggoke Degree College Campus, Khin Moe Moe Khine and Than Than Htet, September 7, 2017, Coll.No. 15.

6. Scientific Name - *Moringa olerifera* Lam., Enc. 1:398. 1785.

Family - Moringaceae

Myanmar Name - Dan da lun

English Name - Horse Radish; Drum stick

Flowering Period - Throughout the year

Morphological Characters

Perennial, small trees; stems and branches terete, glabrous. Leaves tripinnately compound, alternate, exstipulate; leaflets elliptic or ovate. sparsely hairy on both surfaces. Inflorescences axillary or terminal panicles. Flowers bisexual, zygomorphic, creamy-white, fragrant. Calyx 5- partite, petaloid.. Petals 5, free, linear-spathulate, creamy white. Stamens 10, in two whorls, inserted on the edge of the disk; filaments declinate; anthers ditheous, dorsifixed. Ovary superior, slender, stipitate, trilocular, many ovules in each locule on the parietal placentae; style slender; stigma perforated. Fruits cylindrical, longitudinally ribbed, pendulous,. Seeds trigonous, winged at the angle.

Part Used - Leaves, fruits and roots

Literature Used - The leaves and fruits are used as soup for daily vegetables to relieve hypertension . The leaves are anti-inflammatory, anodyne, diuretic, anthelmintic and ophthalmic . The roots are bitter and used as digestive, carminative, anthelmintic, diuretic, cardiac stimulant and asthma (Prajapati *et. al*, 2003).

Specimen Examined - Taunggoke Degree College Campus, Khin Moe Moe Khine and Than Than Htet, August 8, 2017. Coll. No. 13

7. Scientific Name - *Musa sapientum* var. *hpi gyan* L. Syst. Nat. Ed. 2:1303. 1759.

Family - Musaceae

Myanmar Name - Hpi gyan nget pyaw

English Name - Apple plantain

Flowering Period - Throughout the year

Morphological Characters

Perennial, rhizomatous tree-like herbs; aerial pseudo stem is composed of long stiff leafsheaths rolled round each other. Leaves simple, alternate, exstipulate; blades elliptic, leafsheath at the base, entire along the margin, obtuse at the apex, glabrous on both surfaces; petioles long and thick. Inflorescences terminal spikes or panicle covered with large violet spathe. Flowers bisexual or unisexual, zygomorphic,

trimerous, epigynous, creamy white. Tepals 6, in two of 3 each, gamophyllous, only one posterior tepal of the inner whorl is free and boat-shaped, the rest tepal are united forming a tube, creamy white. Stamens 6 (5 fertile and 1 staminode) , in two whorls of 3 each; filaments slender; anthers ditheous, basifixed. Ovary inferior, trilocular, many ovules in each locule on the axile placentae ; style filiform; stigma 3- branched. Fruits berry.

Part Used - Fruits

Literature Used - The fruits are prescribed in China medicine to treat constipation, fever, dysphagia, haemorrhoid, hypertension, swelling and abscesses (Mohamad, 2002).

Specimen Examined -Taunggoke Degree College Campus, Khin Moe Moe Khine and Than Than Htet, August 25, 2017, Coll. No. 14.

8. Scientific Name - *Phyllanthus amarus* Schum., Kongl. Dansbe Vidensk. Selsk. Skrif.4: 195. 1829.

Family - Phyllanthaceae

Myanmar Name - Myae zi phyu

English Name - Sleeping plant

Flowering Period - Almost throughout the year

Morphological Characters

Annual, monoecious herbs; stems and branches slender, glabrous. Leaves simple, alternate, stipulate; blades oblong or suborbicular, rounded at the base, entire along the margin, obtuse at the apex. Inflorescences axillary, clustered cymes of 2 to 3 staminate and solitary pistillate flower. Flowers unisexual, actinomorphic, apetalous; pedicels short in staminate flower, long in pistillate flower. Calyx 5- partite, persistent.. Disk glandular. Stamens 3, free,; filaments very short; anthers ditheous, basifixed. Ovary superior, ovoid, 3-lobed, trilocular, one ovule in each locule on the axile placentae; styles 3, basally connate; stigmas 3,each bifid, recurved. Fruits drupaceous, globoid, depressed. Seeds trigonous.

Part Used - Leaves and stems

Literature Used - A decoction of leaves and stems are used to cure jaundice, hypertension, asthma, liver disease, carminative, itchness, and digestive (Padua *et. al*, 1999).

Specimen Examined - Taunggoke Degree College Campus, Khin Moe Moe Khine and Than Than Htet, August 15, 2017, Coll. No.19.

9.Scientific Name - *Morinda citrifolia* L., Sp. Pl. 176. 1753.

Family - Rubiaceae

Myanmar Name - Ye yo
 English Name - Indian mulberry
 Flowering Period - Throughout the year
 Morphological Characters

Perennial, small trees; stems and branches terete, glabrous. Leaves simple, opposite and decussate, stipulate; blades elliptic or obovate, attenuate at the base, entire along the margin, acuminate at the apex, glabrous on both surfaces. Inflorescences terminal or axillary globose heads. Flowers bisexual, actinomorphic, white, fragrant. Calyx 5-teeth. green. Corolla 5-lobed, rotate. Stamens 5, free, exserted; filaments filiform; anthers dithecal, dorsifixed. Ovary inferior, ovoid, bilocular, one or more ovules in each locule on the axile placentae; style simple; stigma bifid. Fruit berry, strongly odorous. Seeds obovoid or globoid.

Part Used - Leaves, fruits, roots and barks

Literature Used - The leaves are fried with meat or salad to decrease hypertension. The ripened fruits mixed with sugar are edible to cure hypertension. In Indonesia, the baked fruits are given in dysentery and asthma. The roots and bark have a beneficial effect in hypertension, lumbago and rheumatism. An infusion of the root is used in treating urinary disorder and young fruits are used to treat high blood pressure (Mohamad, 2002).

Specimen Examined - Taunggoke Degree College Campus, Khin Moe Moe Khine and group, July 19, 2017, Coll. No. 4.

10. Scientific Name - *Hedychium coronarium* Koen. in Retz. Obs. Bot. 3: 73. 1783.

Family - Zingiberaceae
 Myanmar Name - Ngwe pan
 English Name - White butterfly ginger
 Flowering Period - July to November
 Morphological Characters

Perennial, rhizomatous plants; aerial stem terete, glabrous. Leaves simple, alternate, distichous, exstipulate; blades elliptic - oblong or lanceolate, thick and coriaceous, cuneate at the base, more or less undulate along the margin, acuminate at the apex, glabrous on both surfaces. Inflorescences terminal spike. Flowers bisexual, zygomorphic, white, sessile; bracts numerous. Calyx tubular, greenish white, split down on one side, glabrous. Corolla infundibuliform, white. Fertile stamen erect, filament slender, flattened; anthers ellipsoid; basal staminodes linear-oblong. Ovary oblongoid, trilocular, many ovules in each locule on the axile placentae; style long; stigma capitate to subgloboid.

Part Used - Anthers, rhizomes, flowers

Literature Used - In Brazil, the aromatic flowers and anthers are used for diuretic, hypertension, antidiabetes, and antisyphilitic. The rhizomes are stomachic, carminative, stimulant and tonic (Valkenburg & Bunyaphatsara, 2002).

Specimen Examined - Taunggoke Degree College Campus, Khin Moe Moe Khine and Than Htet, October 5, 2017, Coll. No. 27.

DISCUSSION AND CONCLUSION

Medicinal plants have played an important role in traditional medicine since ancient time and the knowledge of the uses of plants or medicine have been handed down orally from generation to generation.

An ancient time, men studied the available plant material, particularly as a source of food and distinguished between poisonous and non-poisonous plants. While many plants have been used for medicinal purposes, comparatively few of them are cultivated. Most of the plants used for long time in traditional medicines.

A total of 10 species belong to 10 genera of 9 families were recorded to be useful in the treatment of diseases. Most plants are used as decoction alone or with other ingredients. Different parts of the plant such as leaves, flowers, fruits, roots, barks, rhizomes and anthers are used as medicine.

The whole plant of *Eclipta prostrata* L. is used to anti-inflammatory, jaundice, good for blackening and strengthening hairs. The leaves of *Moringa olifera* Lamk., *Catharanthus roseus* (L.) G. Don, and *Morinda citrifolia* L., are used for curing hypertension. The leaves of *Eupatorium odoratum* L. are used for skin wounds, common cold, fever and influenza.

The flowers of *Hedychium coronarium* Koen. are aromatic and used for blood purifying. The decoction of leaves and stems of *Phyllanthus amarus* Schum. are used to treat high blood pressure.

The fruits of *Momordica charantia* L. are used to treat hypertension, liver disease and asthma. The fruit of *Musa sapientum* var. *hapi gyan* L. is used for fever, hypertension and haemorrhoid. The fruits of *Moringa olifera* Lamk., and *Morinda citrifolia* L. are used for curing hypertension and urinary disorder.

The roots of *Morinda citrifolia* L., *Catharanthus roseus* (L.) G. Don. are used for leukaemia and cerebrovascular dilation. The bark of *Morinda citrifolia* L. are used for hypertension. The anthers and rhizomes of *Hedychium coronarium* Koen. are used for curing hypertension.

It is expected that this results will provide useful information and their effective utilization in the treatment of traditional medicines. It is hoped that this results will partially inform and record the medicinal plants grown in Taunggoke Degree College Campus.



A



B



C



D



E

Figure 1. A. *Catharanthus roseus* (L.) G.Don.

B. *Eclipta prostrata* L.

C. *Eupatorium odoratum* L.

D. *Heliotropium indicum* L.

E. *Momordica charantia* L.



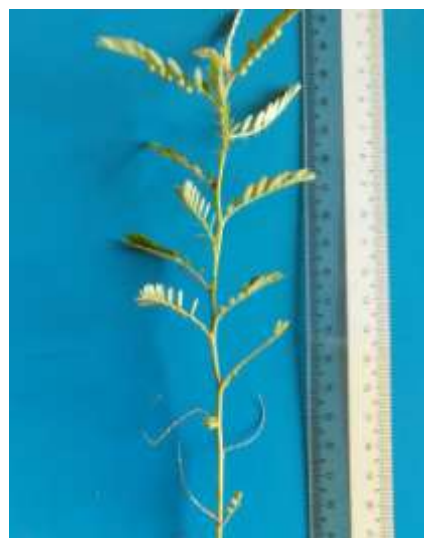
A



B



C



D



E

Figure 2. A. *Moringa olerifera* Lam

D. *Phyllanthus amarus* Schum.

B. *Musa sapientum* var. hpi gyan L.

E. *Hedychium coronarium* Koen.

C. *Morinda citrifolia* L.

ACKNOWLEDGEMENTS

We would like to express our gratitude to Dr Myint Swe, Principal, Taunggoke Degree College, for his permission in this paper in Taunggoke Degree College Campus.

We are especially indepted to Dr Ohn Maung, Professor and Head,, Department of Botany, Taunggoke Degree College, for his permission to undertaken this paper and for his intensive guidanc

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Effect of Different soil Media on the Germination percentage and growth response of Tomato, Eggplant and Bell pepper

*Dr Tin Moe Phyu

ABSTRACT

The experiment was carried out to study the effect of different soil media on growth response and percentage of germination of tomato, eggplant and bell pepper under field conditions. The production of good quality, healthy seedlings require the correct choice of both variety and seedling grower. Therefore, the experiment was conducted in the Department of Botany, Dagon University. Three species were selected for germination percentage and growth response on the different soil media in this experiment. Five treatments each with seven replicates were set up in completely randomized design (CRD). The result showed that the highest percentage of germination (50.0%) of tomato species and (76.79%) of egg plant species were observed from sand treatment .

Keywords: Tomato, eggplant , Bell pepper, soil media, germination percentage, growth response.

Introduction

Seedling production is an important step in the horticultural production system because it influences the final crop yield. Growing media is a major factor that influences seed germination, seedling emergence, seedling growth and quality of seedlings in a nursery. (Corti *et al.*, 1998; Aklibasinda *et al.*, 2011; Unal, 2013). Growing media is not only a place where seeds are sown and seedlings raised, but is also a source and reservoir of plant nutrients (Indriyani *et al.*, 2011). Use of suitable growing media or substrate is essential for production of horticultural crops quality (Bhardwaj, 2014).

Tomato (*Solanumlycopersicum* L.) is a herbaceous plant that belongs to the Family solanaceae. The increase in area of production and value has increased the economic significance of the crop worldwide (Bodunde et al.,1993).

Egg plant (*Solanum melongena* L.) is a popular vegetable crop grows in the subtropics and tropics. Eggplant is well regarded among the vegetables increasingly sought by consumers, whose demand for food with potential health promoting effects, such as disease prevention, is escalating (Cardoso et al., 2009). Bell pepper (*Capsicum annum* L.), which belongs to the Solanacea family, is one of the most popular vegetable crop and widely used foods in almost every part of the world (Abu-Zahra, 2012).

Germination of the seed is a critical stage, because the rest of the plant life is directly dependent upon the rate of its germination. Germination and seedling survival may differ between soil types, since moisture availability may be a function of soil type (Scheffer,1998). Therefore, the

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use of high-quality substrates is important, particularly in organic seedlings production because seedlings are very sensitive to factors of growing media during first stages of growth.

Vermicomposts (VC) are finely divided, peat-like materials with high porosity, aeration, drainage, water-holding capacity, and microbial activity. VC, are often used in sustainable farming systems to improve soil physical properties, provide plant nutrients, and recycle organic wastes. (Edwards 2004; Pandya et al. 2014). Effective Micro-organisms (EM), originates from Japan and is increasingly applied in organic and sustainable farming. The main micro-organisms in EM are lactic acid bacteria , yeasts , photosynthetic bacteria and fungi (Daly & Steward 1999; Higa, 2002). It is therefore the study was aimed to observe the effect of different soil types on germination of Tomato, Egg – plant, Bell pepper, To evaluate growth response on Tomato, Egg-plant, Bell pepper which are treated with different soil types . This study was also expected to know the growers with good nursery management techniques for raising healthy seedlings.

Materials and Methods

The experiment was conducted at a Department of Botany, Dagon University, Yangon Region during June 2017 to September 2017.

Experimental layout and treatments

The experiments were laid out in completely randomized design (CRD) consisting of five treatments, seven replicates and three species were used for this experiment. The treatments used for this experiment were based on different soil media. Each treatment had 56 seeds and thus total of 280 seeds were sown in seed germination. The distance between plants (inside germination trays) and between row were 0.8cm each. The treatments of this experiment were as follows:

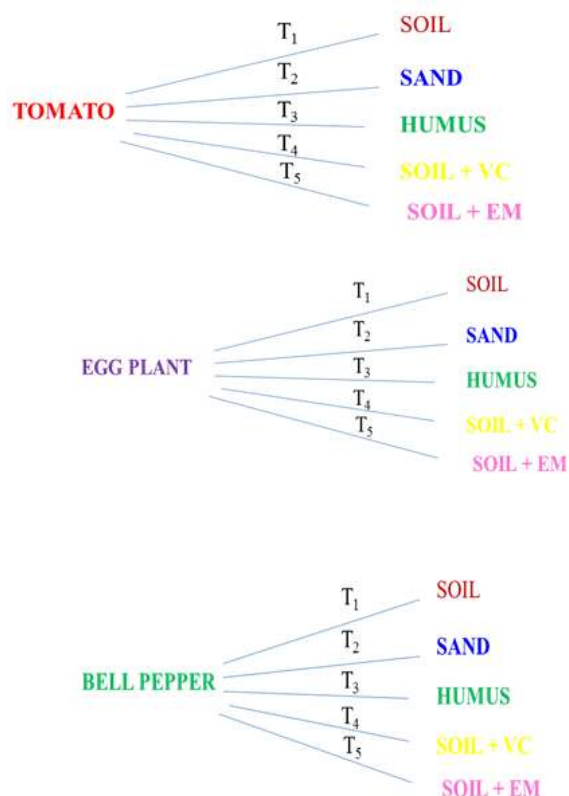
T₁= Soil

T₂= Sand

T₃= Humus

T₄= Soil + Vermicompost (VC)

T₅ = Soil + Effective Microorganisms (EM)



Cultural practices used for germination and growth response (The World Vegetable Center, 2015)

Obtaining seed: Choose locally appropriate tomato varieties and purchase healthy, recently produced seeds from a reliable source.

Seedling container or plug tray method

This method involves raising seedlings in separate pots/containers or plastic/Styrofoam plug trays to provide adequate nutrients and growing medium for healthy root development and seedling growth.

Growing medium: Fill the containers or plug trays with a medium that drains well, such as commercial potting soil, or a mixture of locally available materials such as soil, sand, well-decomposed compost and other good mixtures include vermicompost VC and effective microorganisms EM, to facilitate the emergence of seedlings.

Sowing: Prepare 0.5-1 cm deep furrows 6 cm apart, or 0.5-cm-deep holes 5 cm apart in seedling boxes or trays, and sow one seed per hole.

Watering: Use a fine sprinkler to water daily in the hot dry season or every two days in cooler weather. Avoid excessive watering.

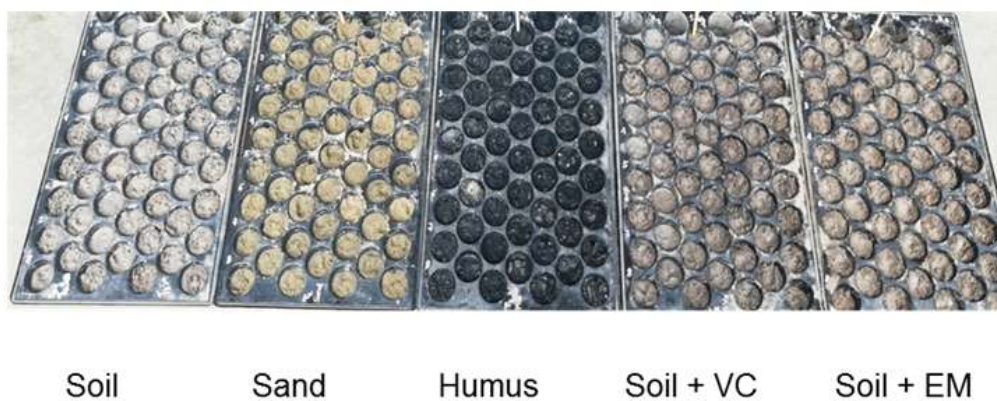


Figure 1. Different soil media in trays

Data Collection

Day of germination was calculated from the time the seed was sown to the point of germination the number of seedlings germinated was also recorded and used to find percentage germination, the germination rate was calculated using the formula.

$$\text{Germination percentage (\%)} = \frac{\text{Germinated seeds}}{\text{Total sown seeds}} \times 100 \text{ (Soupe, 2009)}$$

Results

Germination of three species

The seeds of tomato, egg plant, bell pepper sown on soil, sand, humus, soil + vermicompost and soil + effective microorganisms began to germinate five days after sowing (5 DAS) it was observed that out of seeds planted on each soil media.

The result of germination percentage showed that sand had the highest percentage (50.00 % and 76.79%) in tomato and egg plant species. The maximum percentage was found in humus of bellpepper (94.64%).

Table 1 .The germination percentage of treated different soil media of three species

Species	T1 (Soil)	T2 (Sand)	T3 (Humus)	T4(Soil+VC)	T5(Soil+EM)
Tomato	35.71	50.00	30.36	37.50	42.86
Egg – plant	19.64	76.79	30.36	10.71	8.93
Bell pepper	89.28	91.07	94.64	87.5	83.93

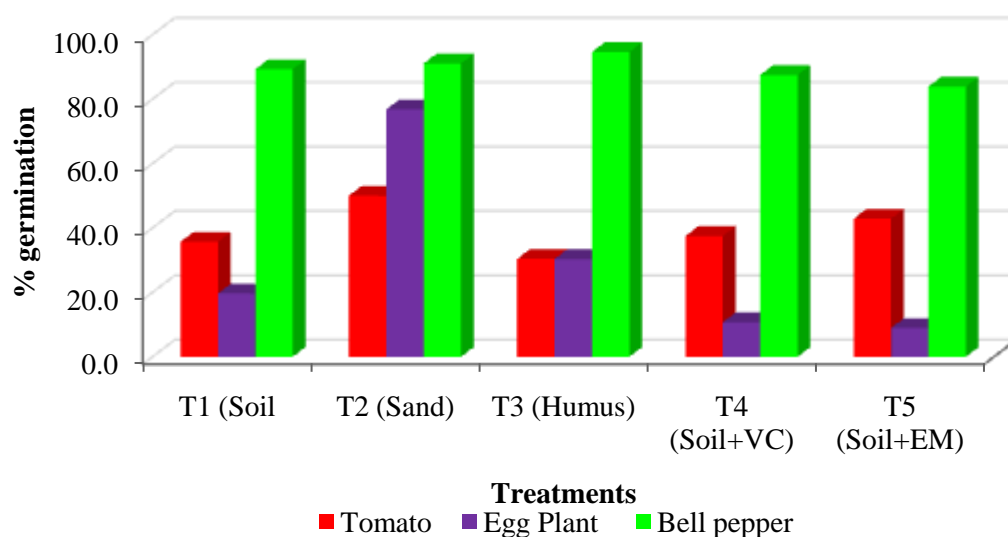


Figure 2. Germination effect on different soil media of three species

Growth response of three species

The evaluation on plant height revealed that soil + VC had the highest length (7.3 cm , 3.4 cm) in tomato and bell pepper species. The highest length had (3.1 cm) found in egg plant species.

Table 2. The growth response of treated different soil media of three species

Species	T1 (Soil)	T2 (Sand)	T3 (Humus)	T4(Soil+VC)	T5(Soil+EM)
Tomato	6.1	6.7	5.5	7.3	6.9
Egg – plant	0.6	3.1	2.3	1.2	1.4
Bell pepper	1.8	2.4	2.6	3.4	3.0

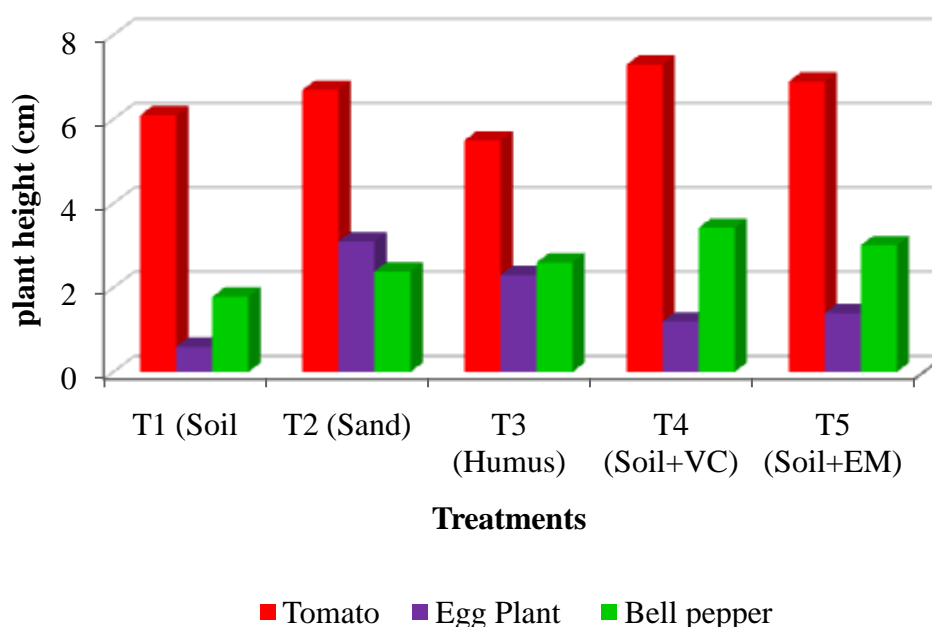


Figure 3. Plant height effect on different soil media of three species

Discussion and conclusion

In this experiment, the germination percentage and growth response on different soil media were carried out on the selected 3 species of Solanaceae family. The germination of seed were started after sowing four days and terminated after two weeks. Seedling germination rate was significantly different between treatments. The result showed the highest percentage of germination (50.0%) was observed from sand treatment, while the lowest (30.36%) related to humus in tomato species. The treatment of sand produced the highest percentage of germination (76.79%) and the lowest percentage formed in the soil + EM (8.93%) in egg plant species. Sand provides for excellent seed germination and a high percentage of seedling survival.

The use of sand for the growing of seedlings, with the direct purpose of avoiding damping – off, has apparently been successfully accomplishes (Dunlap, 1936). The growth response of tomato and bell pepper seeds was observed the highest plant height in soil + vermicompost (7.3cm, 3.4cm respectively) (Figure.2). Vermicomposts plays a major role in improving growth and yield of different field crops, vegetables, flower and fruit crops (Patil & Sheelavantar 2000). Tahmineh Bahrampour (2013) determined the effect of vermicompost on growth, yield and fruit quality of tomato. The effects of earthworm-processed sheep manure (vermicompost) on growth, productivity, and characteristics of bell pepper fruits (Llaven, 2008). This result matches with many publication results before about effect of VC on seedling growth. Some studies reported that a wide range of vegetables germinated better in mixed substrates with VC than in commercial growth media (Atiyeh , 2001).

Under this experiment conditions, the maximum percentage of germination was observed in sand treatment . Soil + Vermicompost treatments increased plant height compared to other

treatments . In conclusion, sand treated plants showed a good germination and VC treated plant influenced significantly to the seedling growth in three species. Improvement in germination and growth response when combine between sand and vermicompost was reflected in a better plant growth.

In this study, the most suitable treatment for germination is sand, whereas the best suitable treatment for growth response is vermicompost.

Acknowledgements

I would like to gratefully acknowledge to Professor Dr. Ohn Maung Professor (Head), Department of Botany, Taunggye degree College for his suggestions and encouragements in this paper. My special thanks go to Dr. Thanda Aye, Professor, Department of Botany, University of Yangon, for her suggestion, comment, valuable advice and encouragement in this paper.

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Appendix



Figure 1. **Germinated on soil**



Figure 2. **Germinated on sand**



Figure 3. **Germinated on Humus**



Figure 4. **Germinated on Soil + VC**



Figure5. **Germinated on Soil + EM**

Appendix Figure 1. Germinated plants of three species in different soil

OCCURRENCE AND ABUNDANCE OF SOME CRAB FAUNA IN MANAUNG ISLAND, MANAUNG TOWNSHIP, RAKHINE STATE

Thein Maung*

ABSTRACT

The study on the occurrence and abundance of some crab from Manaung Island in Rakhine State has been made. The main study sites were from the eastern, western and northern shore of Manaung Island. The study period were conducted from May to July 2016. The research was based mainly on field studies and involved interview with fishermen and crab merchants. The total of seven species of crabs belonging to six Genera, four Families of Order Decapoda were observed. Each species has been identified, classified, measured and recorded. Among them, four species, *Scylla serrata*, *Portunus pelagicus*, *Portunus sanguinolentus* and *Charybdis cruciata* are abundant and commercially important, of which the first species is most abundant and earn a good income for the locals. The rest of the species can be consumed and are available in the local markets.

Keywords: Occurrence, Abundance, Manaung Island, Crab fauna.

INTRODUCTION

Myanmar supports a diversity of marine and fresh water ecosystems and then is endowed with natural resources including rich and various aquatic fauna and flora due to her diversified and most favorable climate, topography and habitats in the region. (Department of fisheries/Myanmar, 2008)

Of all the crustacean, one of the best known and most intensity studied group is some crab species of the Infraorder Brachyuran belonging to the Order Decapoda. The most diverse group of crustaceans alive today. They have been found at abyssal ocean depths down to 6,000 meters, and up to 2,000 meters above sea level on mountains. They are dominant in many estuarine habitats where salinity and temperatures can fluctuate dramatically daily. (Ng, Guinot Davie, 2008)

To have a complete picture of the crab fauna, the writer takes the opportunity to collect more varieties from Manaung Island, identify them and present species from Rakhine State. Also the abundancy, the habitats and biology of the crabs need to be informed for the applied field in the mass production of the required species.

Therefore, the main objective of this study was

- to record the occurrence and abundancy of crab fauna in the coastal area of Manaung Island.
- to study the commercial value of crab fauna within the study area.

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MATERIALS AND METHODS

Study Area

The study area was located in coastal area of Manaung Island, and the main study sites were from the eastern, western and northern shore of it. The island is situated latitude between $18^{\circ} 40'$ and $18^{\circ} 56'$ North and longitude between $93^{\circ} 31'$ and $93^{\circ} 50'$ East (Figure-1). Manaung Island, on the Rakhine Coast, is situated adjacent to the west of Myanmar.=

Study period

The study period lasted from May to July 2016.

Collection of Data

The specimens were collected from fishermen, crab merchants and fishing sites. The number of crabs belonging to different species were recorded, measured, classified and identified up to species level using the taxonomic Keys of Ng, et.al 1998, Martin and Davis (2001). The identified species were recorded by taking colored photographs. Local names of the studied species were informed by the local fishermen and crab merchants.

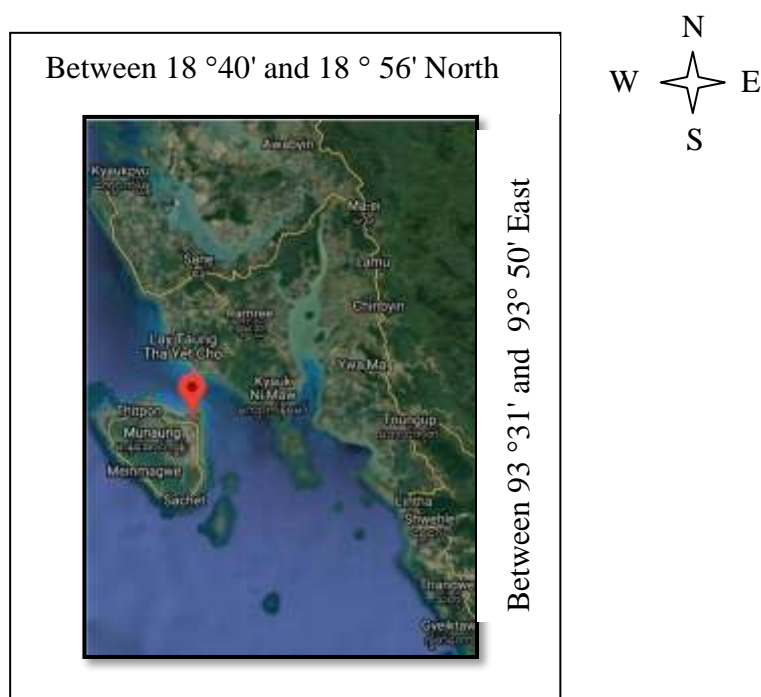


Figure-1 Map of the study area (Source from Google Earth., 2018)

RESULTS

Occurrence of recorded crab species in the study site

A total of seven species belonging to six genera, four families of order Decapoda were recorded in Manaung Island, Manaung Township, Rakhine State.(Table-1) According to Martin and Davis (2001), the crabs are classified.

During the study period, when the percentage of species composition was evaluated, it was found that the family Portunidae topped the rank with 57.1 % and family Dromiidae, Calappidae and Xanthidae respectively were recorded with 14.3 % .(Figure-2)

Table-1 Recorded crab species in the study site

Sr No.	Order		Species	Common name	Vernacular name (Manaung Island)
1	Decapoda	Dromiidae	Dromia dormia	Sleepy sponge crab, Common sponge crab	Kati-par-kyauk-ka-nan
2		Calappidae	Calappa philargius	Box crab, Burrowing crab, Spectacled box crab	Kyauk-ka-nan
3		Portunidae	Scylla serrata	Mud crab, Mangrove crab, Serrated swimming crab, Giant mud crab, Edible mud crab	Ka-nan-gaung
4			Portunus pelagicus	Blue swimming crab, Blue crab, Flower crab, Blue manna crab, Sand crab	Ge-phar
5			P. sanguinolentus	Three spot swimming crab, Red-spotted swimming crab, Blood-spotted swimming crab	Wa-thone-lon-ka-nan
6			Charybdis cruciata	Mask crab, Coral crab	Pinle-ka-nan-kyar
7		Xanthidae	Atergatis integerrimus	Edible crab	Goke-ni

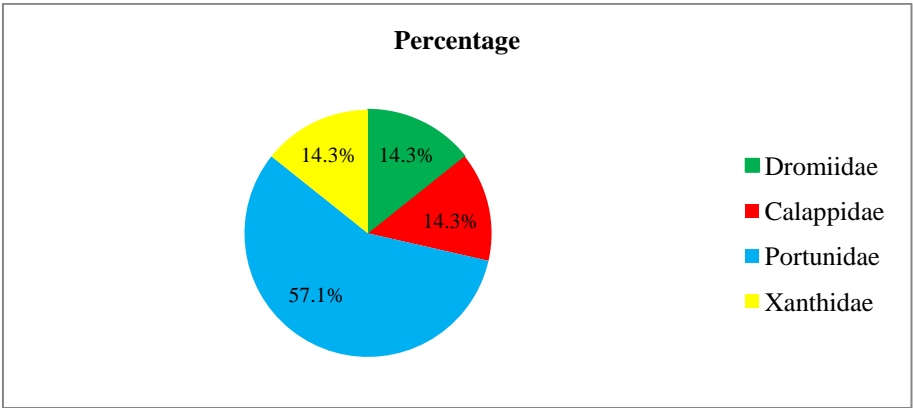


Figure-2 Species Composition of crab species in different families

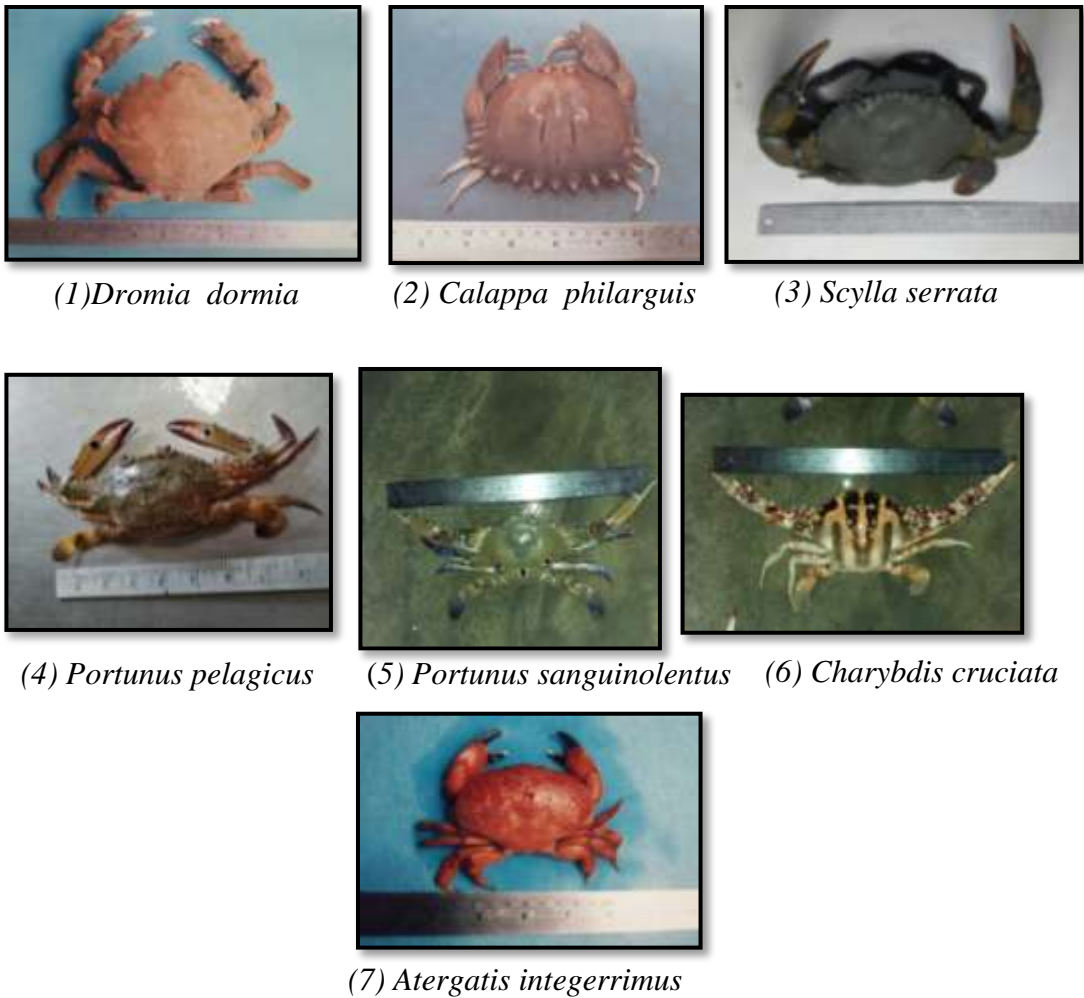


Plate-1 Recorded crab species in study area

Description of the studied species

(1)*Dromia dormia*

Number of specimens : One male specimen

Length of carapace - 12 cm (Male)

The carapace is convex, pentagonal, broader than long. There are four unequal spines on the antero-lateral borders of carapace, the third of which is very small and close to the second. The first spine much larger. The first and second spines have many hairs. Frontal grooves is shallow.

Chelipeds are equal and massive, outer face of palm inflated, inner superior margin with four tubercles. Chelipeds are generally much stouter than the legs and have many hairs. A pair of forelegs is shorter than a pair of hind legs. In the tips of legs are a sharp claw.

Carapace, chelipeds and legs are grayish yellow or grayish dirty white. The tips of the thumbs and fingers of the chelipeds are white. Abdomen of the crab is grayish yellow.

It inhabits in rocky regions of shallow waters where in fine grain sands are mixed with muddy slit.

(2)*Calappa philargius*

Number of Specimens : One female specimen.

Length of carapace - 9 cm (Female)

The extreme length of the carapace is two-thirds of the extreme breadth. Carapace nearly smooth, except for a few lumps anteriorly and a few scattered granules posteriorly. The antero-lateral borders are beaded and finely festooned. Its posterior border is also beaded. There is a large tooth in the middle of the posterior border, and the tooth bounding that border on either side is more salient. The endostomial septum has its anterior border strongly convex and projecting.

The two anterior lobes have a spine each. The upper surface of the palm of chelipeds is nearly smooth. The crest of palm is deeply seven-toothed.

Carapace is light brown. The finger and thumb of chelipeds pale yellow and their tips white. The legs has brown and white lines.

It inhabits in the waters of muddy sand shore and rocky outcrops shore.

(3)*Scylla serrata*

Number of Specimens : Fifty male and forty-five female specimens.

Length of carapace - 8.5 cm (Male); 7 cm (Female)

There are nine sharp teeth of about equal size on the antero-lateral borders of carapace. The flagellum stands in the orbital hiatus. Carapace is a little oval in shape, its upper surface smooth and convex. The transverse ridges are oblique from the last spine of the antero-lateral border to branchial region. Front cut into four lobes or blunt teeth of about equal size and is prominent.

Chelipeds almost twice the length of the carapace in the adult male, but shorter than this in female and young male. Arm with three spines on the anterior border and two spines on the posterior border. Inner angle of wrist is a strong spine, and outer angle of wrist is one or two teeth. Legs unarmed. Abdomen of male broadly triangular.

Carapace and all appendages are dark olive green with lighter circular spots. Chelipeds are yellowish green or dark brown in the dorsal and they are reddish yellow or reddish brown. The legs are reddish dark brown.

It inhabits muddy bottom in brackish water along the coast and mudbank in estuaries and mangrove swamps. They are prefer muddy bottom and seagrass beds.

(4)*Portunu spelagicus*

Number of Specimens : thirty male and twenty female specimens.

Length of carapace - 6.4 cm (Male); 7 cm (Female)

There are nine teeth on the antero-lateral borders of carapace, of which the first spine is much the largest. The most external spine is 2 to 4 times larger than the precedent. There are four triangular teeth in the front. Posterior angles of carapace rounded. Carapace is broad, little convex. Two transverse lines is on the gastric and one is either branchial region. The rostrum lies in the between two antennae.

Chelipeds are more elongate in males than in females. The chelipeds are nearly 2.5 times the length of the carapace. The hands of the chelipeds are a little unequal in size. Hand as massive as the arm. The arm has three large spines on the anterior (inner) border and one at the far end of the posterior border. The wrist has three spinules. Legs are smooth and are laterally flattened to varying degrees in last 2 segments of last pair paddle-like.

Carapace is bluish or purplish green with the extensive irregular faint white spots. Chelipeds is bluish green with faint white spots. Tips of chelae and tips of legs is purple.

It inhabits in the waters along sandy shores, in tidal pools of rocky shores and in sand-muddy depths of shallow waters.

(5)*Portunus sanguinolentus*

Number of Specimens : forty-seven male and forty-five female specimens.

Length of carapace - 6 cm (Male); 5.5 cm (Female)

Carapace is very broad, little convex. There are nine teeth on antero-lateral borders of carapace, of which the first lateral spine is much the longest and largest. The first lateral spine is about four times as long as any of the others. Carapace is three brown spots in posterior half, persisting quite long in preserved specimens; surface finely granulated anteriorly, smooth posteriorly. Front with four triangular teeth, outer pair broader and very slightly more prominent than inner ones. Posterior angles of carapace are rounded.

Cheliped merus with postero-distal border smooth, anterior border with 3-4 sharp spines; carpus with inner and outer spines; lower surface of plan smooth. The hand is the most massive segment. Posterior border of swimming leg without spines or spinules. Swimming legs are flattened and claws are long.

Carapace is dark yellowish green conspicuously marked posteriorly on the branchial region by three brown spots ringed with white.

It inhabits sandy to muddy substrates. It is commonly seen in waters along sandy beach or in tidal pools of the rocky shores.

(6)*Charybdis cruciata*

Number of Specimens : Twenty-nine male and twenty-three female specimens.

Length of carapace - 7 cm (Male); 7 cm (Female)

Carapace is glabrous, about two-third as long as broad, slightly convex. In the carapace, there are transverse lines on protogastric and mesogastric regions, epibrachial line interrupted at the cervical groove and in its middle. The antero-lateral borders are out into six spines of about equal size including the outer orbital angles, of which the first is truncated and notched or bifid. Front with six subequal triangular distally rounded teeth.

The chelipeds are nearly 2.5 times the length of the carapace and except for definitely placed costae and spines are sharp and smooth. The hands are a little unequal in size.

Cheliped marus with three spines on anterior border, posterior border smooth. Palm with 2-3 spines on upper border. Merus of swimming leg with a posterior subdistal spine.

Carapace is orange brown with a large yellowish white cross. The dorsal of chelipeds is yellowish brown with white patches and the ventral of chelipeds is white with brown patches, the tips are pink and light brown. Legs are faint yellow with the white patches.

It inhabits rocks, stones, and sandy muddy substratum.

(7) *Atergatis integerrimus*

Number of Specimens : One male and one female specimen.

Length of carapace - 3.8 cm (Male); 5.8 cm (Female)

The anterior third or half of carapace surface irregularly and rather distantly pitted, especially near the front and antero-lateral borders. The edges of antero-lateral borders are sharp and crest like, and form a ridge at the lateral epibranchial angle. The front which is little prominent, meets the antero-lateral border at a wide but very distinct angle. Orbits are very small. Their width is much less than a third the width of the front.

Chelipeds are equal. The upper edge of the merus is sharply crested. The upper edges of the thumb and finger are more bluntly crested. The outer surface of the legs is hardly pitted.

Carapace is brick red with whitish pits. Chelipeds and legs are brick red with the pits. Fingers and thumbs are black with whitish tips and teeth.

It was found among loose rocks of rocky shore at the low tide level. The crabs inhabit coral reefs, sandy or rocky bottoms.

Table-2 Recorded number of crab species under taxonomic status categories (May to July, 2016)

Sr.No	Number of Order	Number of Family	Number of Species	Number of Specimen
1	Decapoda	Dromiidae	Dromia dormia	1
2		Calappidae	Calappa philargius	1
3		Portunidae	Scylla serrata	95
4			Portunus pelagicus	50
5			P. sanguinolentus	92
6			Charybdis cruciata	52
7		Xanthidae	Atergatis integerrimus	2
Total	1	4	7	293

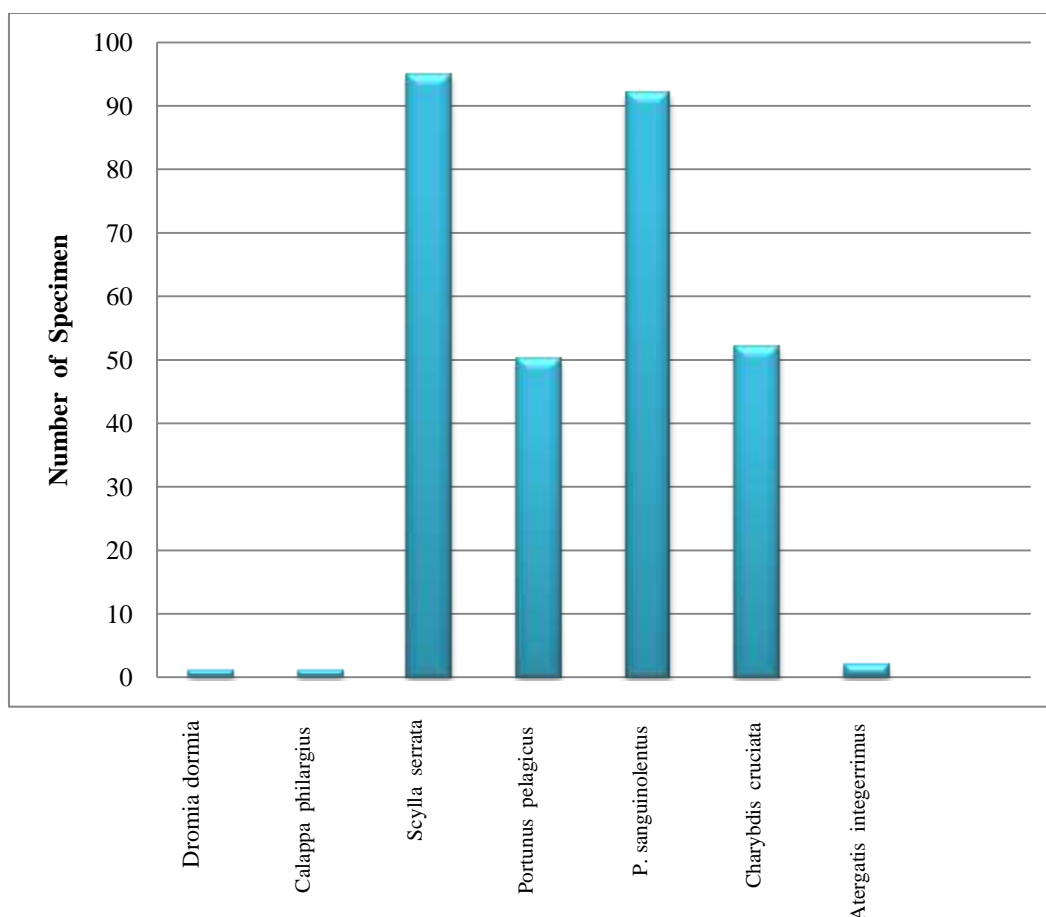


Figure-3 Number of recorded crab species in the study site.

According to the recorded crab species, the total of 293 specimens of recorded crab species were recorded in the study site. (Table-2). Among the recorded crab species, the highest number of specimen was observed *Scylla serrata* species in the study site. The lowest number of specimen was observed *Dromia dormia*, *Calappa philargius* and *Atergatis integerrimus* species. So *Scylla serrata* is the most abundant species in the study area. (Figure-3)

DISCUSSION

The present work was commenced from May to July 2016. Manaung Island situated in the west coast of Rakhine State has the beautiful, broad shores on its western and northern side not being disturbed by many locals and tourists. During low tides, the beautiful organisms with various coloration can be seen moving busily about looking for food and shelter. Among these the crabs are most distinct due to their bright coloration of different shades. The writer very much interested to have the knowledge on the number of species present on this island. This would contribute in the academic field, to the locals and to fishery purposes as to their distribution, habit and habitats, abundancy biodiversity and conservation.

In the present study, a total of seven species, six genera and four families of edible crab fauna under order Decapoda were recorded in shore area of Manaung Island. In this work, the family Dromiidae (1 species), family Calappidae (1 species), family Portunidae (4 species) and family Xanthidae (1 species) were identified and described. During the study period, the species composition of recorded crab species was found to be the highest percentage under the family Portunidae (57.1%) in the present study. According to the information from locals though some crab species are rare, some species can be available. The genus *Dromia* consists of one species namely *Dromia dormia* which is rare species. The genus *Calappa* comprises one species namely *Calappa philargius* which is rare during raining months. The genus *Scylla* consists of one species namely *Scylla serrata* which is of commercial importance and is of great demand for local as well as export markets. These crabs are culture in mangrove swamps to marketable size. The genus *Portunus* comprises two species namely *Portunus pelagicus* and *Portunus sanguinolentus* are also of commercial importance, could be collected on sandy beach. The genus *Charybdis* consists of one species namely *Charybdis cruciata* which is economic important. The genus *Atergatis* consists of one species namely *Atergatis integerrimus* is rare (Table-3).

The crabs are a good source of food to marine life as well as to man a good protein source. Most marine crabs are cultured economically as sea food in world wide. It is also suggested here that *Scylla* sp. could be culture up to marketable size in mangrove swamps. Crabs of economic importance need application of hatchery operation for quality seed productions which are to be culture for consumption locally as well as for export.

Table-3 Abundance, Rarity and economic importance of studied crab fauna
(May to July,2016)

Abundant Species	Rare Species	Economic important Species
<i>Scylla serrata</i>	<i>Dromia dormia</i>	<i>Scylla serrata</i>
<i>Portunus pelagicus</i>	<i>Calappa philargius</i>	<i>Portunus pelagicus</i>
<i>Portunus sanguinolentus</i>	<i>Atergatis integerrimus</i>	<i>Portunus sanguinolentus</i>
<i>Charybdis cruciata</i>		<i>Charybdis cruciata</i>

CONCLUSION

The results of this research indicate that there is a diverse marine crab species in shores of Manaung Island, Rakhine State. In present study, seven species were classified, identified and recorded. Of these four species belonging to Family Portunidae are abundant, of commercial importance and are usually consumed by locals as seafood. The abundance and diversity of crab species could be varied depend on particular habitats and natural food sources. It is suggested that future research workers need to investigate on more species for the academic purpose and biodiversity of the species. The present study gives some information on crab species in Manaung Island, Rakhine State and it would support partial of fulfillment for information dealing with crab fauna of Myanmar.

ACKNOWLEDGEMENTS

I would like to express gratitude to Dr. Myint Swe, Principal of Taunggoke Degree College, for his kind permission to write this research paper. I also wish to express my greatest thanks to Professor Dr. Khin Myint Zin, Professor and Head, Department of Zoology, Taunggoke Degree College, for her experience, guidance and advice in this paper.

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INVESTIGATION ON MORPHOLOGY, ANATOMY OF LEAVES AND PRELIMINARY PHYTOCHEMICAL TEST ON *ERIOLOBUS* *INDICA* SCHN.

Khin Ei Chaw¹, War War Aung², Khin Myo Thwe³, Than Than Htet⁴

ABSTRACT

Eriolobus indica Schn. belongs to the Family Rosaceae in the order Rosales. It has high medicinal value for demulcent, cardiac tonic, expectorant, astringent, dysentery, snake and insect bites. That plant is commonly known as pin-sein-thee in Myanmar. The plants were collected from Kalaw Township, Southern Shan State. The description of this plant was given according to literature. The anatomical characters of leaves were also made and presented in this paper with photographic records. The fresh specimens were cut by free hand sections and examined under microscope. The preliminary phytochemical test showed the presence of alkaloids, carbohydrates, glycosides, phenolic compounds, saponins, tannins, terpenoids, steroids, starch, reducing sugar and the absence of α -amino acid.

INTRODUCTION

Eriolobus indica Schn. belongs to the family Rosaceae. It is known as crab apple. It is mostly occurred in hilly regions. In Myanmar, the plant is widely distributed in Shan, Kachin State and Mandalay Region, commonly known as Makawk, Taung-gwe, Myet-chin-nu and Pin-sein-thee.

Lawrance (1964) states that the Rosaceae has about 115 genera and 3200 species distributed over most of the earth and abundant in Eastern Asia North America, and Europe. There are about 3200 species widely distributed around the world. Flowering and fruiting period is from January to December.

The morphology and taxonomy of the vegetative and reproductive parts, anatomy of the leaves and preliminary phytochemical investigation of the fruits of *Eriolobus indica* Schn. were carried out in this paper. The anatomical studies on the leaves of *Eriolobus indica* Schn. of Metcalfe and Chalk (1972) showed that the leaf hairs were generally unicellular in the form of simple trichome, or occasionally united to form tufts. Calcium oxalate was usually secreted in the form of solitary or clustered crystal in the leaves .

Eriolobus indica Schn. were used as traditional medicine such as demulcent, cardiac tonic, diuretic, expectorant, astringent, dysentery, pile, snake and insect bites. Photographic records for morphological and anatomical characteristic of this species and preliminary phytochemical tests has been presented in this paper.

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Checked by Daw Thinzar Kyaw , Daw Myat Myat Aung

MATERIALS AND METHODS

Botanical Study

The plants samples of *Eriolobus indica* Schn. were collected from Kalaw Townships, Southern Shan State in May 2016. Immediately after collection some of the specimens were pressed, dried and preserved for study and storage.

After collection, the leaves were mounted between blotting papers and news paper sheets, pressed subjected and sun-dried. When the specimens were dried, they were mounted onto herbarium sheets.

The fresh specimens of vegetative and reproductive parts have been used for identification. The morphological study of the plants was undertaken with the help of available literature Manandhar (1974) and Hundley and Chit Ko Ko (1987).

Anatomical Study

The anatomical studies of the leaves were also examined by free hand sections according to the methods given by Trease and Evans (2002) and identification of the leaves anatomy studied by the literature of Metcalfe and Chalk (1972). For cleaning, section cutting of the specimens were warmed in chloral hydrate solution. The anatomical study of the leaves were examined by maceration by boiling with 10% nitric acid and small amount of glacial acetic acid. Photographic plates were prepared from the free hand sections and macerated materials of the leaves were also presented.

Preliminary Phytochemical Test

Preliminary phytochemical examination of the fruits of *Eriolobus indica* Schn. (Pin-sein-thee) has been conducted with the test reagent in Botany Department of Dagon University according to the methods described in British Pharmacopoeia (1965) and these stated by Harbone (1973), Marini-Bettelo (1981), Trease & Evans (2002).

About 5 g of the fruits powdered of Pin-sein-thee was extracted by using 100 ml of water, ethanol and pet-ether (60°-80°C). These extracts were screened to know the presence or absence of alkaloids, carbohydrates, glycosides, phenolic compounds, saponins, tannins, terpenoids, steroids, starch, α -amino acid and reducing sugar. The result are shown in Table 1 and Figure 4.

RESULTS

Morphological Characters of *Eriolobus indica* Schn.

Scientific Name	- <i>Eriolobus indica</i> Schn.
Syn	- <i>Docynia indica</i> Dene.
	- <i>D. graffithiana</i> Dene.
	- <i>Pyrus indica</i> Wall.
	- <i>Cydonia indica</i> Spach.
Myanmar Name	- Pin-sein-thee, Ma Kawt, Taung-gwe, Myet-chin-nu

English Name	- Crap apple
Family	- Rosaceae
Flowering period	- January to March
Fruiting periods	- March to November

The plants is perennial ever green tree, commonly 30-50ft tall. Leaves simple, alternate. Petiolate, light green, mostly lanceolate, up to 5.5-9.5 cm long, 1.5- 4.5 cm wide, tomentose, the base obtuse, the margin entire, the tips acute, the lateral veins 6-12 pairs. Inflorescence, axillary, 1-3 flowers cyme, flower pale green or white, bracteates, bracteolate, pedicellate, bisporangiate, hypanthium narrowly campanulate, epigynous. Calyx 5, aposepalous, valvate, about 0.45 ×0.2 cm in diameter, green, valvate, persistent, superior. Corolla 5, apopetalous, petaloid (Pale green to white), superior, tomentose. Stamen α (20-30), monadelphous, filament unequal, basifixed, entorse, anther dithecous, longitudinal dehiscence. Carpel 3-5, syncarpous, 3-5 locular, axile placentation, 1-3 ovule in each locule, style short, stigma capitate, ovary globose terete, inferior. Fruit globose, yellowish green with orange spot, hard, calyx persistent. Seed black, glabrous.

Figure 1. Morphological Characters of *Eriolobus indica* Schn.

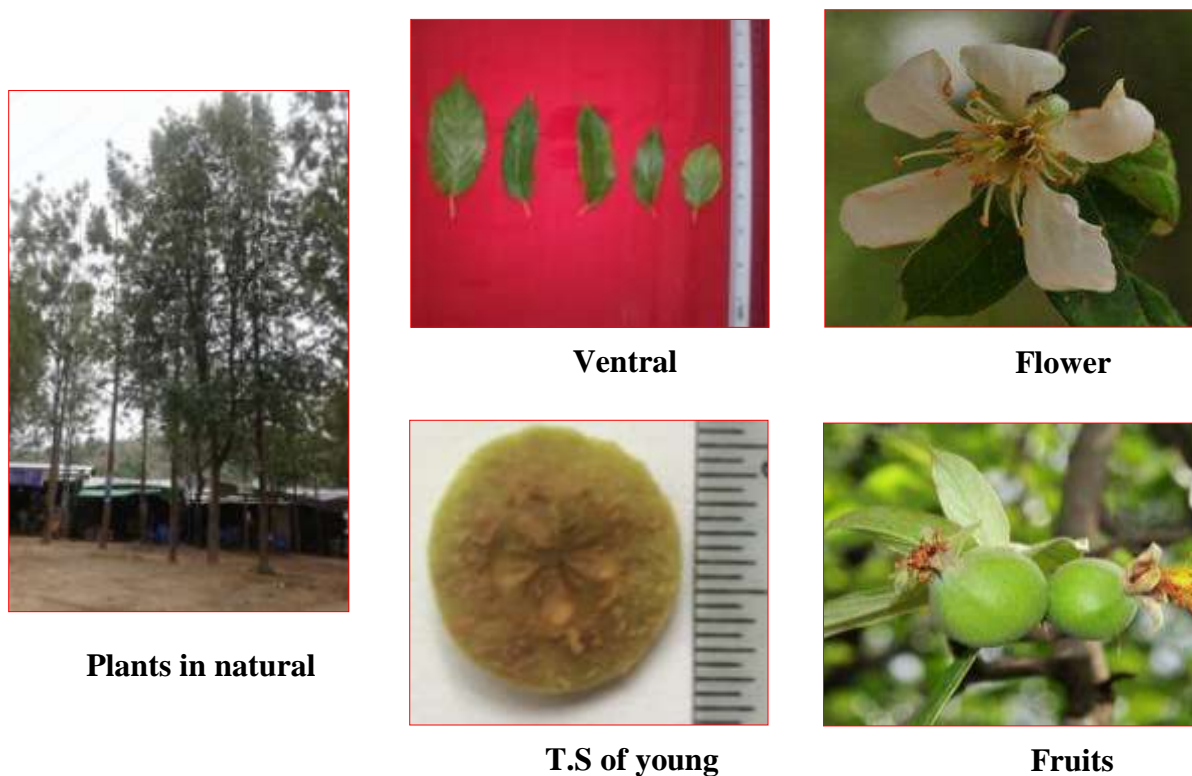


Figure 2. Anatomical Characters of *Eriolobus indica* Schn.

Lamina



Surface view of upper epidermis



Surface view of lower epidermis



T.S of lamina showing palisade and spongy mesophyll

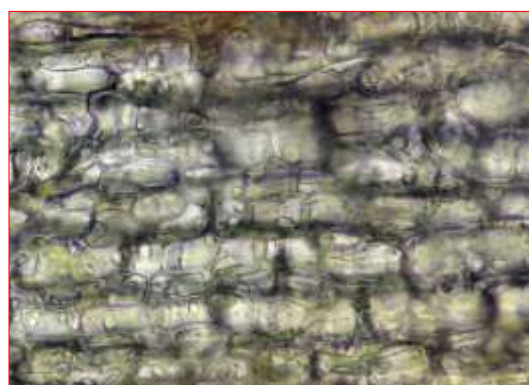


T.S of midrib showing cortical region and vascular bundle

Midrib



T.S of petiole showing epidermis, cortical region and vascular bundle



Surface view of petiole

Figure 3. Tracheary Elements of macerated Leaves of *Eriolobus indica* Schn.

Vessel



Spiral



Reticulate

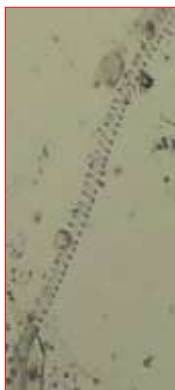


Pitted



Annular

Tracheid



Spiral



Annular



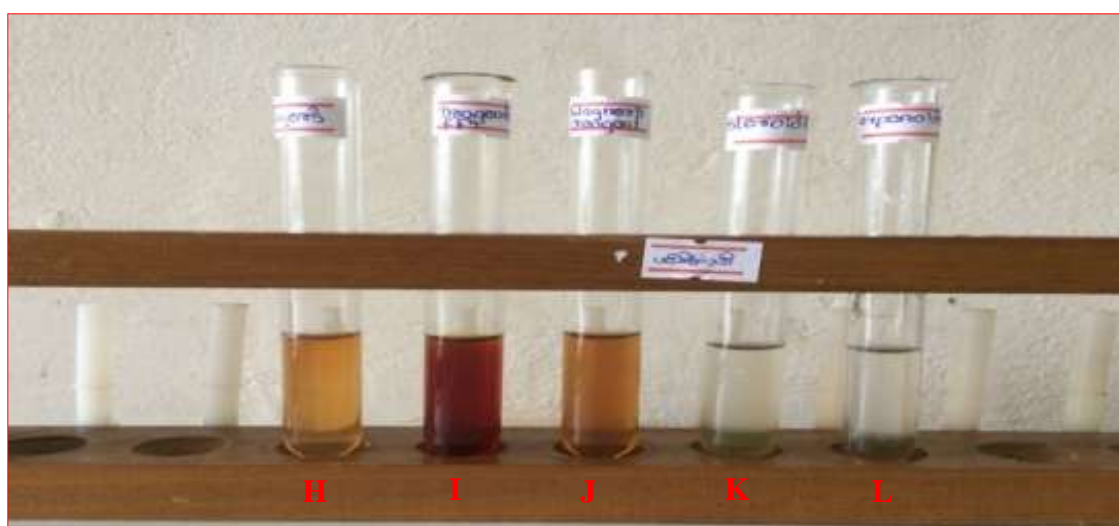
Fibre tracheid



Fibre



Sclereids



A – Carbohydrate

B -Glycosides

C. Saponin

D- Tannin

E –Starch

F – α -Amino acid

G- Reducing sugar

H- Alkaloid (Mayer's reagent)

I - Alkaloid (Dragendroff's reagent)

J - Alkaloid (Wagner's reagent)

K –Steroids

L - Terpenoids

Figure 4. Preliminary phytochemical examination of *Eriolobus indica* Schn.

Preliminary phytochemical examination of *Eriolobus indica* Schn.

Phytochemical investigation of the fruit of *Eriolobus indica* Schn. (pin-sein-thee) extracts showed that the presence of alkaloids, carbohydrates, glycosides, phenolic compounds, saponins, tannins, terpenoids, steroids, starch, and reducing sugar and absence of α -amino acid. The result were shown in table (1).

Table 1. Preliminary phytochemical test of *Eriolobus indica* Schn. fruits by test tube method

No.	Constituents	Extract	Reagent used	Observation	Remark
1.	Carbohydrates	H ₂ O	10 % α -naphthol, Conc: H ₂ SO ₄	red ring	+
2.	Glycosides	H ₂ O	10 % lead acetate	white ppt.	+
3.	Saponins	H ₂ O	Distilled water	frothing	+
4.	Tannins	H ₂ O	1 % FeCl ₃	brownish green ppt.	+
5.	Starch	H ₂ O	Iodine solution	bluish change	+
6.	α -amino acids	H ₂ O	Ninhydrin reagent	violet colour	-
7.	Reducing sugar	H ₂ O	Benedict's solution	yellow or red ppt.	+
8.	Alkaloids	1% Con:HCl	1.Mayer's reagent 2.Dragendroff's reagent 3.Wagner's reagent	white ppt yellow or red ppt colour change	- + +
9.	Steroids	Pet-ether	Acetic anhydride Conc: H ₂ SO ₄	pink colour	+
10.	Terpenoids	CHCl ₃	Acetic anhydride Conc: H ₂ SO ₄	pink colour	+

(-) = absent

(+) = present

ppt = precipitate

DISCUSSION AND CONCLUSION

In this paper, morphological and taxonomical characters of the plant *Eriolobus indica* Schn. are described. In this paper, the plant is perennial ever green tree, leave alternate, simple, petiolate; Flower bisexual, actinomorphic, complete, regular, penta-merous, epigynous. Calyx 5, aposepalous, green, persistent, superior. Corolla 5, pale green to white, caducous, superior. Stamens numerous, extrorse. Gynoecium 3-5 carpellary, syncarpous, axile placentation, style short, stigma capitate. Fruit globose, seed black, glabrous. These characters are in accordance with the description given by Manandhar (1974) and Kubitzki (2004).

In histological studies, the trichomes are abundant in lower surface of the leaves, anomocytic stomata are more abundant on lower epidermis. Vascular bundles are arranged in crescent shape in the midrib. In the petiole, vascular bundles are also arranged in crescent shape. These bundles are collateral and closed types. These are agreed with those of Esau (1953) and Metcalfe and Chalk (1969).

According to the phytochemical investigation of the fruits of *Eriolobus indica* Schn. , these fruits contained alkaloids, glycosides, saponin, tannin, terpenoids, steroids carbohydrate, a little sugar and starch. The determination of nutrients values of this plant showed that protein, fat and carbohydrates were present. Carbohydrates provided the body as the fuel which are needed for physical activity and for proper organ function. Proteins are used mainly for growth, repair and development during childhood, adolescence and pregnancy. Proteins are expensive sources of energy, whereas carbohydrates and fats are the more economical energy in food. The deficiency of proteins can cause the anemia disease. Fat played a vital role to maintain the healthy skin and hair, body temperature and promoting healthy cell function.

These data provides very useful information for phytochemical characterization of the fruits of *Eriolobus indica* Schn. and for testing the health benefits of fresh fruit. Medicinal value of *Eriolobus indica* Schn. used in traditional medicine such as demulcent, cardiac tonic, expectorant, astringent, dysentery, pile, snake and insect bites and rich in antioxidant properties Manandhar (1974).

It is intended that the result of the present will contribute the information towards a better understanding of morphology and anatomy of genus *Eriolobus indica* Schn. in Myanmar and to know the chemical constituents and medicinal properties of the species in this paper.

ACKNOWLEDGEMENTS

We would like to express deep gratitude to Dr Myint Swe, Principal of Taunggoke Degree College for his encouragement, and comments related to this research paper.

We would like to express our deepest gratitude to Dr. Ohn Maung, Professor and Head, Department of Botany, Taunggoke Degree College for his invaluable guidance, continuous advice and for providing information and reference books.

We want to express our gratitude to Dr. Myat Myat Moe, Professor and Head of Botany Department, Dagon University for her advice and encouragement .We wish to express our sincere thanks to Dr. Ohn Mar Kyaw and Dr. Khin Moe Moe Khine, Associate Professors, Department of Botany, Taunggoke Degree College for their kind suggestions and advice . We also give our thanks to all of our teachers from whom we have learnt since our childhood and to all our colleagues for their valuable assistance.

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SCREENING OF ENDOPHYTIC BACTERIA FROM LEAVES AND FRUIT OF AVOCADO AT PIN-TA-YA TOWNSHIP

Yee Yee Nwe¹¹, War War Aung¹², Than Than Htet¹³, Su Thet Yi¹⁴

ABSTRACT

Plant-associated bacteria that live inside plant tissues without causing any damage to plants are defined as endophytic bacteria. The term endophyte (Gr. endon, within; phyton plant) was first coined in 1866 by De Bary. The isolation and screening of endophytic bacteria from and their ability to produce antimicrobial and enzyme were carried out. The two samples were collected from Pin- Ta-Ya Township. The results of the endophyte isolation in these experiments gave ten strains (5 species from leaves and 5 species from fruit) from leaves and fruit by using nutrient medium. Among the bacterial isolates, A 5, 7, 9 and 10 bacteria showed the antiagrobacteria against *Agrobacterium* sp. which can cause tumor. Another five bacteria isolates showed the antimicrobial activity against four test organisms by using well diffusion method. Continually, morphology and biochemical characters of these ten strains were further studied for identification. Only two isolated strains revealed hydrogen sulphide test. SN- 4, 7, 9 and 10 showed positive results of nitrate test. Among than SN- 1, 2, 3 and 5 showed positive results for glucose fermentation test. Except SN- 2, it was showed positive results of citrate utilization. Isolated strains SN- 1, 3, 5 and 10 showed positive results of urease. All isolated bacteria were found positive effect on catalase, salt tolerant, casein hydrolysis and starch hydrolysis, the results indicated that they can produce specific enzyme. Continually, morphology and biochemical characters of these ten strains were further studied for identification.

INTRODUCTION

Plants are one of the most vital sources of medicines. Currently, large numbers of drugs in use are derived from plants. Medicinal plants are the chief source of secondary metabolites used as drugs and essential oils of therapeutic importance. The important advantages of medicinal plants for therapeutic uses in various ailments are their safety and also being inexpensive, effective, and their easy accessibility. These advantages of the medicinal plants forced the traditional medical experts for extensively used in their day to day practice.

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Plants can be considered as a new source of microorganisms. The plant parts can be utilized in the isolation of bioactive compound producing microorganisms. This means that there is much possibility of finding new microorganisms from plant sources. Today, the antimicrobial metabolites are required to have potent activity and be safe to humans, animals and ecosystems. The pharmaceutical agents derived from natural sources are an important part of our therapeutic strategies since beginning due to their chemical diversity and various bioactivities against diseases.

Plant-associated bacteria that live inside plant tissues without causing any damage to plants are defined as endophytic bacteria. Endophytic bacteria living in plant tissues deprived of doing substantive harm or gain benefit other than residency (Kado, 1992). The term endophyte (Gr. endon, within; phyton, plant) was first coined in 1866 by Bary. An endophyte can be defined as a microorganism such as fungi or bacteria that spends either the complete or part of its lifecycle within the healthy tissues of a living plant, typically causing no symptoms of disease (Tan, 2001 and Gunatilaka, 2006) .

The microbes existing in plants are called endophytic microbes. These microbes spent part or their entire lifetime in the living tissue of the host plant without causing any harm (Petrini et al., 1992). Microbes such as fungi, yeast, and bacteria associated with the host plant assist in the metabolites with potent medicinal activity such as antitumor, antibacterial, and antifungal compounds as decomposing enzymes, and also plant growth hormone (Petrini et al., 1992; Strobel et al., 1996; Strobel, 2002).

Now we are familiar with the fact that endophytic microorganisms that reside in the tissues of living plants are promising, less explored and useful sources of novel natural products for exploitation in agriculture, medicine, and industry. The importance of endophytes had been demonstrated over a long period as a source of pharmaceutical bioactive compounds, as many of endophytes were exposed to produce novel bioactive metabolites such as antibacterial, antifungal, antiviral, antitumor, antioxidant, anti-inflammatory, immunosuppressive drugs, and many related compounds.

Endophytes are well known for the production of various classes of natural products and have been reported to exhibit a broad range of biological activity and are grouped into various categories, which include alkaloids, terpenoids, steroids, lactones, phenolic compounds, quinones, lignans, etc. Importantly, secondary metabolites produced by endophytes provide a variety of fitness enhancements and exert several beneficial effects on host plants, such as stimulation of plant growth (Sturz et al., 1997) nitrogen fixation (Kirchhof et al., 1997; Reinhold-Hurek and Hurek, 1998) and induce resistance to drought, herbivorous, parasitism (Chen et al., 1995; Sturz and Matheson, 1996).

The purpose of this study was to evaluate several isolated bacteria from leaves and fruit of *Persea gratissima* Gaertn and to select on endophytic bacteria for further morphology, biochemical characteristic and antimicrobial activity. In this investigation, altogether ten endophytic bacteria are isolated into pure culture by using nutrient medium from leaves and fruit of sample. The isolated strains are subjected into the examination concerning bioactive substances with medicinal activity of isolated bacteria as antimicrobial activity. The report on the isolation of useful microbes from native plants in Myanmar is still rare.

MATERIALS AND METHODS

Collection of plant materials

For the isolation of endophytic bacteria, healthy leaves and fruit were collected from healthy wild and cultivated plants from Pin-Ta-Ya Township. Samples were placed in clean plastic bags, brought to the laboratory and used for further experimental purpose.

Isolation procedure of endophytic bacteria strains (Atlas, 1993 and Phay, 1997)

The collected samples of leaves and fruits were washed in running water for 10 minutes. These leaves and fruits were rinsed with sterilized distilled water for 5 minutes. Then, they were sterilized by soaking in 75% alcohol for 2 minutes. After that these fruits were dried on sterilized paper. Then, the fruits were cut into about 1-2 cm pieces and they were placed on nutrient medium plates. The plates were incubated for one to two days at room temperature. The nutrient medium was used as stock medium.

Biochemical Characteristic of Isolated Endophytic Bacteria

The biochemical of isolates was conducted according to Bergey's manual of Determinative Bacteriology (Holt et al., 1994) and Moore et al., (1988). For each strain of the following tests including Gram staining, oxygen requirement, Hydrogen sulfide, salt to tolerant, nitrate reduction, citrate utilization, methyl red, Voges proskauer, Urea hydrolysis, Determination of carbohydrate, Starch hydrolysis.

Antimicrobial activity Estimation

The study of antimicrobial activity was performed by paper disc method described by Cruickshank. 1975 and using six test organisms (*Pseudomonas aeruginosa*, *Escherichia coli*, *Staphylococcus aureus*, *Saccharomyces* sp. and *Agrobacterium tumefaciens*). The clear zones appeared around the agar well, indicated the presences of antimicrobial activity secreted by respective isolated strains.

Results

Collection of Sample

The sample are collected from Pin-Ta-Ya Township

Family	-	Lauraceae
Scientific Name	-	<i>Persea gratissima</i> Gaertn
Myanmar Name	-	Htaw-bat-thee



Figure 1. Collection of Leave and Fruit of *Persea gratissima* Gaertn from Pin-Ta-Ya township

Screening of Endophytic Bacteria

In the present works, altogether ten isolated strains were maintained into the pure culture and designated as SN- 1 to 10. All the isolated bacteria SN-1 to 10 were sub cultured on to the respective selected media to provide pure culture. They were then sub cultured on the agar slants for further investigation.



Figure 2. Isolation of Endophytic Bacteria from *Persea gratissima* Gaertn Leaves and Fruit

Table 1. Biochemical Characteristics of Isolated endophytic Bacteria Strains (SN-1 to 10)

Tests	1	2	3	4	5	6	7	8	9	10
Cell morphology	cocci	cocci	cocci	cocci	cocci	cocci	bacilli	cocci	cocci	cocci
Gram strain	-	-	-	-	-	-	-	-	-	-
Catalase	+	+	+	+	+	+	+	+	+	+
Aerobic/Anaerobic	Aero	Aero	Aero	Aero	Aero	Aero	Aero	Aero	Aero	Aero
Glucose(acid)	+	+	+	-	+	-	-	-	-	-
NaCl 6.5%	+	+	+	+	+	+	+	+	+	+
NaCl 1.0%	+	+	+	+	+	+	+	+	+	+
Urease	+	-	+	-	+	-	-	-	-	+
Citrate	+	+	+	+	+	+	-	+	+	+
Caseinase	+	+	+	+	+	+	+	+	+	+
Hydrogen sulphide	+	-	-	-	-	+	-	-	-	-
Starch hydrolysis	+	+	+	+	+	+	+	+	+	+
Growth at 23°C	+	+	+	+	+	+	+	+	+	+
Growth at 45°C	+	+	+	+	+	+	+	+	+	+
Nitrate Test	-	-	-	+	-	-	+	-	+	+

' + ' = positive result

' - ' = negative result

Preliminary study on antimicrobial activity of isolated strains

In this study, it was observed that SN-1, 5, 7, and 10 showed high potential in six antimicrobial activity test as shown in Table (2) and Figure (5)

Table 2. Antimicrobial activity of all isolated Isolated Endophytic Bacteria Strains (SN-6 to 10)

Strain No.	<i>Agrobacterium tumefaciens</i>	<i>Escherichia coli</i>	<i>Pseudomonas aeruginosa</i>	<i>Saccharomyces sp.</i>	<i>Staphylococcus aureus</i>
SN-1	—	10mm	18mm	17mm	17mm
SN-2	—	—	—	—	—
SN-3	—	—	—	—	—
SN-4	—	—	—	—	—
SN-5	16mm	10mm	15mm	16mm	18mm
SN-6	—	—	—	—	—
SN-7	15mm	25mm	10mm	18mm	—
SN-8	—	—	—	—	—
SN-9	18mm	—	—	—	—
SN-10	14mm	14mm	10mm	15mm	18mm

well = 6 mm

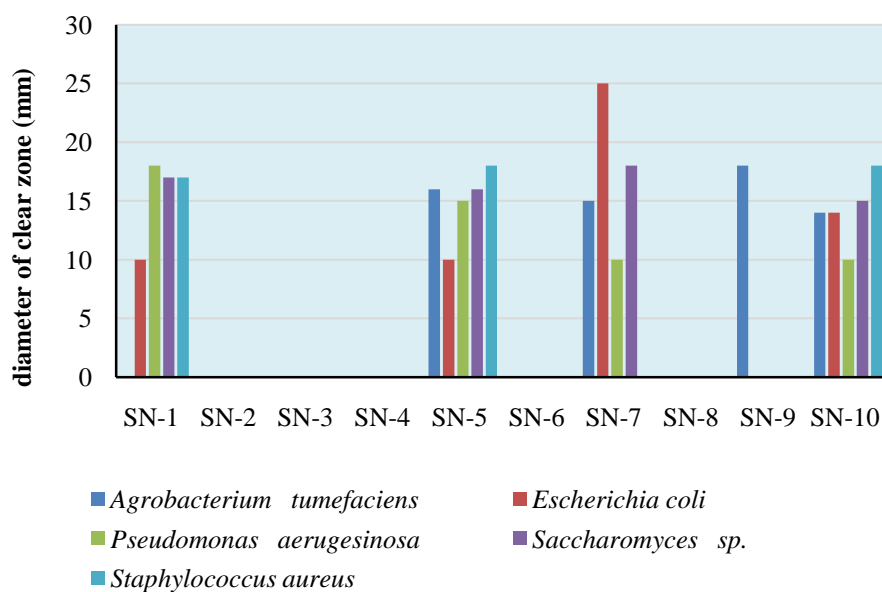


Figure 3. Antimicrobial activity of all isolated Isolated Endophytic Bacteria Strains (SN-1 to 10)

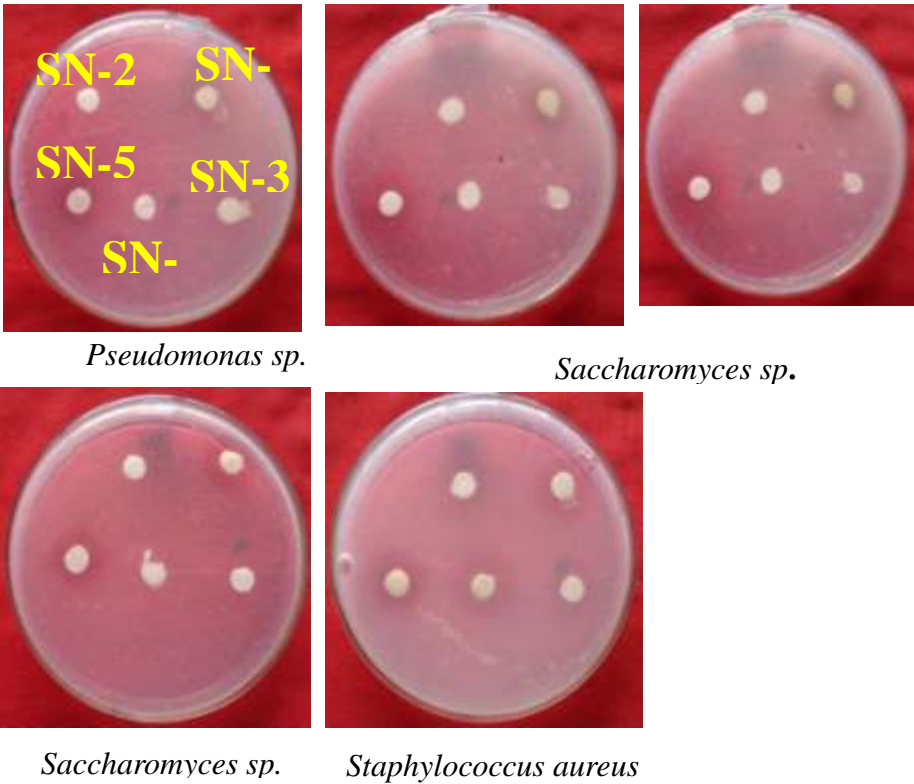


Figure 4. Antimicrobial Activity of fermentation broth A 1 to 5Against FiveTest Organisms

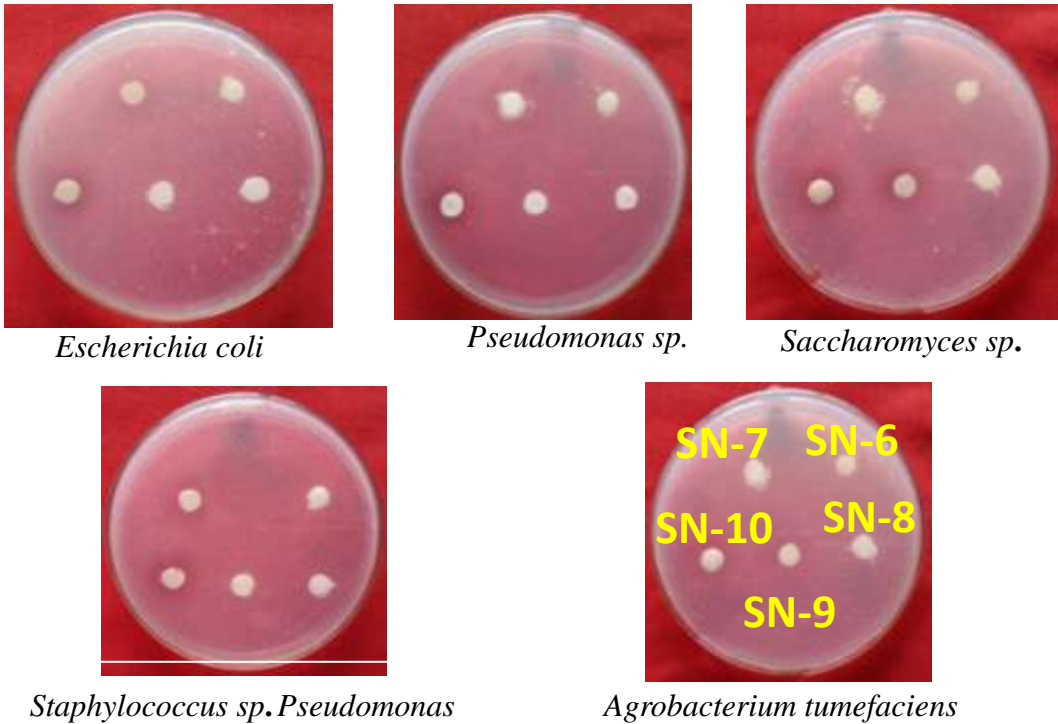


Figure5 . Antimicrobial Activity of fermentation broth A 6 to 10Against Five Test Organisms

Discussion

An overall sample of 10 isolates of endophytic bacteria was recovered from leaves and fruit of (*Persea gratissima* Gaertn) thriving at Microbial Lab. at Dagon University. Endophytic bacteria showed creamy, slimy, soft, and sometimes mucoid, rough, dry colonies. In preliminary screening isolates were found Gram-negative. For biochemical and physiological tests, all isolates gave positive results for catalase and all showed positive results for starch hydrolysis. The result indicates that they can produce catalase and amylase enzyme. The amylase enzyme split starch into simple sugar.

Likewise, all isolates showed positive results for motility tests. SN- 1, 2, 3 and 5 showed positive results for glucose fermentation test and SN- 4, 6, 7, 8, 9 and 10 not showed for glucose fermentation. In total 10 isolates showed aerobic and SN- 4, 7, 9 and 10 showed positive results and indicates that they can produce caseinase enzyme. Except SN-2, it was showed positive results of citrate utilization. As preliminarily screened for their antimicrobial properties in nutrient medium on against (*Pseudomonas aeruginosa*, *Escherichia coli*, *Staphylococcus aureus*, *Saccharomyces* sp. and *Agrobacterium tumefaciens*). SN - 1, 5, 7, 9 and 10 isolates exhibited some extent of inhibitory capacities (Figure 6 and 7). Distribution of important features of isolated bacterial endophytes is shown in Table (2). Out of two (SN- 1 and 6) gave positive results for Hydrogen sulphide. An overall sample of 10 isolates of endophytic bacteria was visible positive effect on milk hydrolysis.

Conclusion

In general, endophytic bacteria occur as lower population density than rhizospheric bacteria or bacterial pathogen. The surface of plants carries a wide range of microbial contaminants. To avoid this source of infection and for the isolation of endophytes, explants must be thoroughly surface-sterilized before inoculating them onto the nutrient medium. The optimum condition for the surface sterilization of the *Persea gratissima* Gaertn was found as treating the leaves, and fruit with 70% alcohol for 1 minute followed by treatment of 3-5 times sterile rinse of the *Persea gratissima* Gaertn. These wide range of morphology and biochemical and characteristics of the endophytic bacterial isolates indicated that they are different bacterial species. Significant variation appeared in the types of indigenous bacteria isolated from different parts of host plant species.

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gratissima Gaertn .These wide range of morphology and biochemical and characteristics of the bacterial isolates entophytic indicated that they are different bacterial species. There appeared significant variation in the types of indigenous bacteria isolated from different parts of host plant species. Endophytes are well known for the production of various classes of natural products and have been reported to exhibit a broad range of biological activity and are grouped into various categories, which include alkaloids, terpenoids, steroids, lactones, phenolic compounds, quinones, lignans (Tan and Zou 2003, Strobel and Daisy, 2003). Endophytes can be a promising source of bioactive compounds, and should be continuously isolated, characterized, and investigated for the discovery of lead bioactive compounds which can be employed in agriculture, medicine, and industries (Tiwari et al., 2013 and Sturz, 1997). Endophytes can be an alternate source of drugs which will help to conserve biodiversity and drug resistance.

Acknowledgements

We are grateful to Dr. MyintSwe, Principal, TaunggokeDegree College for the use of research facilities related to the research work. We would like to express our deepest gratitude to Dr. OhnMaung, Professor and Head, Department of Botany, TaunggokeDegree College for his invaluable guidance, continuous advice and for providing information and reference books. We want to express our gratitude to Rector (Retired) Dr. U Win, for his advice and encouragement. Our thanks go to Dr. Ohn Mar Kyaw and Dr. Khin Moe MoeKhin, Associate Professors, Department of Botany, Taunggoke Degree College for their kind advice and suggestions. We also give our thanks to all of our teachers from whom we have learnt since our childhood and to all our colleagues for their valuable assistance.

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