Botanical Study and Important Uses of Tinyu (*Pinus* Spp.) Forest in Pang Long area

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Abstract

Myanmar is the largest country in mainland Southeast Asia with a land area of 676,577 km². Forests constitute the dominant ecosystem in Myanmar, with 47 percent of the country ecologically classified as forest (FAO 2015). This percentage is so critical role for Myanmar. In this research, 10 species of Tinyu (*Pinus* spp.) in Pang Long area of Southern Shan State in East part of Myanmar were collected and studied during from June 2016 to March, 2017. The identification and classification of collected species are based on botanical point of view by many author citations. Tinyu (*Pinus* spp.) community are deeply effect on forest ecosystem for environmental status, they were used clearly cutting for fuel woods, overexploitation and illegally forest trade by native tribal people in this region. The aims and objectives of this research are ethno botanical uses of Tinyu (*Pinus* spp.) in Pang Long area, natural resources conservation, protect from degradation, maintain ecological balance and environmental quality by National formulate stringent law and regulation (NBSAP) (2015-2020).

Keywords: Tinyu (*Pinus*Spp.) forests, ethno botanical uses, overexploitation, conservation, reforestation

Introduction

More than 40% of Myanmar is mountainous. Prominent mountain chains include an extension of the Eastern Himalaya, the Chin Hills, the Western Plateau/ Rhaching Yoma, Bago Yoma, the Eastern Plateau/ Shan Plateau and the Taninthayi Region. Forest constitutes only 47 percent in Myanmar. They are important as they regulate climatic conditions, prevent from erosion, provide timber, fruits, and medicinal plants; protect public health by absorbing contaminants of the environment and give suitable habitats for all living things. But due to improper management, vast stretches of forests are strongly losing every year. Only the forests act as a renewable resource. So, proper management and awareness among people are very important. Tinyu, conifers (Gymnosperms) are another ancient group of land plants forest that was once dominant in most plant communities worldwide. The study area is Pang Longin Southern Shan State of Myanmar and about 4440 square miles and located between 20˚59’ 30” N 97˚31’15” E at an elevation of 1366m. The mountainous Shan hills forest is temperate deciduous. In this research, 10 species,4 families of Order Pinales in Division Pinophyta of Gymnosperms were presented. 1 species of *Pinus elliottii* Engelm. in family Pinaceae, 5 species of family Cupressaceae; *Platycladus orientalis* (L) Franco, *Juniperus chinensis* L., *Juniperus sabina* L., *Juniperus horizontals* Moenh and *Platycladus horizontalis* (L.) Endl., 3 species of *Cunninghamia lanceolata* (Lamb.) Hook. *Glyptostrobas pensilis* K. Koch and *Taxodium distichum* Rich.in family Taxodiaceae, 1 species of *Araucaria heterophylla* Franco. in family Araucariaceae. The morphology of these species was identified by many references and author citations. The degradation process of Tinyu (*Pinus* spp.) has appered by human activities in region. These effects caused environmental degradation (MOECAF, Ministry of Environmental Conservation and Forestry (2013).This research highlights the various Order Pinales species in gymnosperms group and their important valuable natural resources status for region, Myanmar.

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Materials and Methods

Classification and Identification

Tinyu were collected from some areas of Pang Long in Southern Shan State during from June, 2016 to March, 2017. Then the classification and identification were made by using vegetative and reproductive characters according to many author citations.Collection survey techniques of Tinyu (*Pinus* species) in Pang Long area.

RESULTS

Morphology of Gymnosperm (Coniferous families)

Conifers comprise a monophyletic group of highly branched trees or shrubs with simple leaves. Leaves of conifers are linear, acicular (needle-like) or subulate (awn-shape). In some conifers, leaves are clustered into short shoot, in which adjacent internodes are very short in length. An extreme of this is the fascicle, e.g; in species of *Pinus*. Conifers produce male cones and female cones, either on the same individual (monoecy) or less commonly, on different individuals (dioecy). In all vascular plants, cones consist of an axis that basesporophylls. Male strobilus have male sporophylls. Male sporophylls bear the male sporangia (microsporangia) that produce pollen grains. Female cones of most conifers are different from those of other seed plants. Conifers female cones have a compound structure. They consist of an ovary that bears modified leaves called bracts, each of which subtends the seed bearing structure called ovuliferous scale.

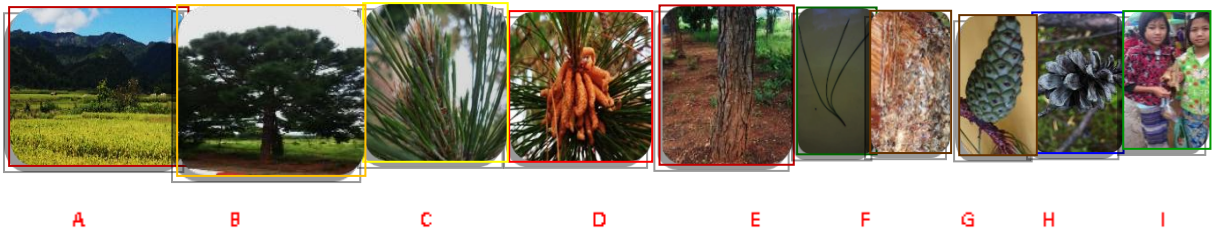
Gymnosperm
Coniferophytina
Pinadae
Pinales
Pinaceae
Cupressaceae
Taxodiaceae
Araucariaceae

1. Family- Pinaceae

Genus – *Pinus elliottii* Engelm.

Common Names - Tinyu

Trees to 30m tall, trunk to 0.8m d.b.h.in native range, bark greyish-brown, furrowed into irregularly oblong, scaly plate, branch lets growing twice or more each year, orange-brown, later becoming brown to greyish brown, roughly scales, needles 2 or 3 per bundle, 18-25 cm×2mm, stout, yellow or blue-green, resin canals 2-9-11, mostly internal seed cones solitary or paired, peduncle to 3cm, pale brown, ovoid-cylindrical, 7-20cm, maturing in 2 years, stout, prickle, seed dark brown, ellipsoid, 6-7mm, wing to 2cm.*Pinus elliottii* is strongly use for ornamentation, fuel wood, and other purposes. Especially *Pinuselliottic*is widely distributed and it is used as fuel wood .It is being seriously cut on hill –side and causing environmental degradation.



A.Tinyu forest (Pinus),**B**. Pinus habit, **C**. Male Cone (young), **D**.Male Cone (mature) **E**. Trunk, **F**Three foliage leaf **G**. Oil surface in wood, **H**. Female Cone (young) ,**I**.Female Cone (mature). **J**. Using as fuel (Pinus)

2. Family – Cupressaceae

Platycladus orientalis (L) Franco

Common Names - Nil

Tree 8-20m tall, trunk to 1m d.b.h, crown pyramidal when young, broadly ovoid when old. Leaves 1-3mm, green, apex bluntly pointed, facial leaves rhomboid, with conspicuous, lateral leaves overlapping facial ones, boat-shaped, ridged. Pollen cones are yellowish green, ovoid 2-3mm. Seed cones are bluish green when they are immature, when they are ripe, they are reddish brown, sub-ovoid, 1.5-2.5x1-5cm, fertile cone scale 1-2 seeded. Seeds greyish brown or purplish brown, ovoid, 5-7x3-4mm, slightly ridged, wingless. This species belongs to endangered (EN) list of threatened plant in Myanmar (IUCN Red list 2015-20110).

A.Habit, **B**.Cones, **C**.Maturecones. **D,E,F**. Mature cone of Male and female, **G,H**.Young cone of male and female

3. *Juniperus chinensis* L.

Common Names – Chinese Juniper

Tree to 25m, 35m in d.b.h, dioecious, bark greyish brown, fissured, branch spreading straight or slightly curved, terete or 4-rangled, 1-1.2mm diameter, crown of trees pyramidal to open, broad and irregular. Leaves dimorphic, needle like leaves present, decussate or in whorls of 3, loosely arranged, ascending, lanceolate, 6-12mm, scale like leaves present on adult plants decussate, closely apprised , 2.5-5.0mm long, male cone yellow, ellipsoid, 2.5-3.5mm, micro sporophylls 10-18,. Seed cones mature in 2nd year, brown when ripe, sub-globose, 6-8mm in diameter, 1-4 seeded, seed ovoid, 3-6x2-8mm, flattened, ridged, resin pits. It is ornamental tree and also traded by illegally wildlife from Myanmar to neighboring countries. This species is being VU (Vulnerable) status in Myanmar. IUCN Red List 2015—2020)

A. Habit, **B**. Trunk Scale, **C**. leaves, **D**. Young of male and female cones, **E** Mature cones, **F** Used as ornamental

4. *Juniperus Sabina* L.
Common Names- Nil

Shrub is very variable in shape, up to 1-4 m tall. The leaves have one of two forms, juvenile needle-like leaves 5-10 mm long, and adult scale-leaves 1-2mm long on shoots, 0.8-1mm thick. Juvenile leaves are found mainly on seedlings but mature shrubs. It is largely dioecious with separate male and female plants. The cones are berry-like, 5-9mm in diameter, blue-black with a whitish waxy bloom, and contain 1-3 seeds, they are mature in about 18 months. Male cones are 2-4mm long. This specie is sustainable for their PGR (Plant Genetic Resources)

A. Habit, **B**. Scale leaves, **C**. Time of pollination

5. *Juniperus horizontalis* Moenh
Common Names- Nil

Dense multi- stem evergreen shrub with a ground hugging habit of growth, up to 20cm, scale-like leaves are highly ornamental and turn purple in fall. Neither the flowers nor the fruit are significant. It grows at a slow rate, and under ideal conditions can be expected to live for approximately 30 years. It is planted for landscaping and illegally traded to neighboring countries. It must be conservative for PGR (Plant Genetic Resources) in native region. (NBSAP 20115-2010).

A .Habit, **B C.** Scale leaves

6. *Platycladus horizontalis* (L) Endl.
Common Names- Nil

Evergreen coniferous tree is small, slow-growing tree, to 15-20m tall and 0.5m trunk diameter. Foliage leaves form in flat sprays with scale-like leaves 2-4mm long. The cones are 15-25mm long, green ripening brown in about eight months from pollination. Seeds are 4-6mm long, with no wing. It is larger ornamental plants in garden. This species is rapidly degradation by serious problems of genetic hybridization process.(NBSAP 2015-2010).

A Habit , **B**. Trunk , **C**. Young male and female cones, **D**. Mature male and female cones

7. Familiy – Taxodiaceae

Cunninghamia lanceolata (Lamb.) Hook.

Common Names-Nil

Tree up to 50 m tall, trunk to 3 m d.b.h, bark dark grey to dark brown or reddish brown, longitudinally fissured, leaves narrowly linear- lanceolate, straight or slightly falcate, 2-6cmx3-5mm, base decurrent, apex spinesent, margin denticulate, adaxial surface glossy deep green. Male cone conical, 0.5-1.5cm long, with a short peduncle, 40 clustered at apex. Seed cones terminal, 1-4 together, ovoid or sub-globose, bracts glaucous, broadly ovate, seeds dark brown, 5-6x4mm, narrowly winged laterally. Itis large and long ornamental plants and very useful for woods. It must be sustainable development for reforestation as an ecological balance. It is VU (Vulnerable specimens) in their native. (NBSAP 2015-2010).

A. Habit, **B**. Trunk , **C.** Young male and female cones , **D** Mature Femalecone , **E**.Youn male cone, **F**.Strongleaves, **G.** Pollination of female cone

8. *Glyptostrobus pensilis* (Staunton ex D. Don) K. Koch (Water pine)

Common Names- Nil

Semi –deciduous tree to 15-25m tall, trunk to 1.2m d.b.h, basal part 0.7m buttressed, bark brown or greyish white with brown tinge, cracking into long irregular stripe, main branches spreading horizontally, lateral branches in 2 rows, older branches very dense and broom like. Scale leaves on mature branch lets appressed, 2mm long, with scattered, whitelinear leaves compressed, 2 rows, 1-3cmx1.5-4mm, pale green, base narrow, apex ovate, leaves deciduous with shoot branchlets in winter. Seed cones obovid, 14-2.5x0.9-1.5cm. Seed brown, ellipsoid, flattened, 5-7x3-4mm, basal wing 4-7mm. This species is rare in this area becausetheir pollination type is carried by wind and it is very difficult for successful breeding. Therefore, their PGR (Plant Genetic Resources) must be sustainable and take care for HCVF (High Value Conservation Forest) in study area. (NBSAP 2015-2010).

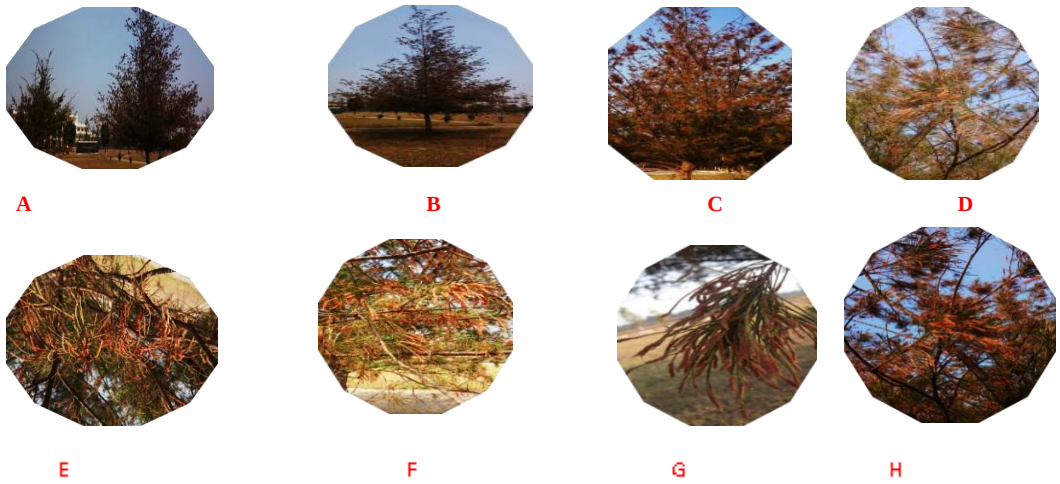
A.Habit, **B**.Using as landscaping, **C**.Fall down by cutting, **D**.Mature conesmale and female ,**E**. Pollination time of cones, **F**. After pollination,

9.*Taxodium distichum*(L.) Rich.

Common Names -Sawmp cypress

Deciduous tree, 50m tall, 2m in d.b.h in native habitat, pneumatophores present or absent around trunk, trunk swollen and buttressed at base, strongly tapered upward, bark brown, peeling off in long strips, main branches spreading horizontaly or ascending, lateral branchlels 2-ranked. Leaves lineas, flat, base twisted, 1-1.5cmx1mm, apex acute, pale green, medium depressed adaxially yellowish green or greyish green, midvein raised abaxially .Male cones bone in terminal, crowded, short,

dense racemes panicles 5-12cm, shortly pedunculate, ovoid. Seed cones brownish yellow or white powdery, globose, oblong-globose, or ovoid, 2.5cm in diameter, cone scale shield-shaped, woody move or less conspicuously longitudinally grooved at the apex. Seeds brown or reddish brown, irregularly triangular-pyramidal, 1.2-1.8cm long, sharply ridged.Their female cones are frequently immature state while male cones at maturity. Thus, male cones persist at the time of pollination on plants and it is difficult to achieve pollination. It must be high standard for PGR (Plant Genetic Resources). (NBSAP 2015-2010).



A. landscaping, B.habit, C. pollination, D. Male and female cone, E.F. Time of pollination, G. After pollination,
H. Pollination by wind

10. Family – Araucariaceae

Araucaria heterophylla (Salisb.) Franco.

Common Names -Mionkey puzzle, Pedetha-tinyu

Tree to 30m up to 70m in original habitats, bark dark grey, flaking: crown towers-shaped, branch lets spreading horizontally or drooping, lateral branch lets pinnately arranged, drooping. Leaves dimorphic, those of young trees and lateral branch lets loosely arranged, spreading openly, bright green, , laterally depressed, , 6-12mm, 3 or 4 ridged, mature trees and cone bearing branch lets ,ovate or triangular-ovate, 5-9mm, widest at base, mid vein obviously raised or not, apex obtuse. Male cones are terminal and solitary. Seed cones subglobose, 8-12x7-11cm, widen than long, apex of bracts triangular, flattened, acute, up curved. Seed ellipsoid, flattened, with a lateral wing. Their distribution rate is slow because, male and female cones of this species cannot be successfully pollinated by their immature sex organs. Moreover, it is being traded by illegally wildlife to neighboring countries. This species is service for tribal people activity (NBSAP 2015-2010).

A.habit, **B**. Trunk, C. Scale leaves **D**. Mature leaves with, **E**. Mature leaves, **F**. Young leaves with cones

Environmental Impact Assessment by Clear Cut and Illegally Wildlife Trade of Tinyu(*Pinus*Species) in Panglong Area

Variations in latitude, altitude and climate in Myanmar create a variety of habitats and support correspondingly rich plant biodiversity. There are 61 globally threatened plant species known to occur in Myanmar. In this research, 10 species of Tinyu were critical role fornative tribal people and their environments. Tinyu forest maintain native ecosystemand their destroyedwill lead to global warming and will affect the weather, decline of biological diversity and future living generations.

Deforestation status of Tinyu (*Pinus* Species) burned by human in Pang Long area

Overexploitation for burning to *Pinus* (Tinyu), illegally cutting and trade

Daily uses by humanity, recreational land by *Pinus*, community service, ornamentation by*Pinus*

DISCUSSION AND CONCLUSION

There are totally 50 threatened plant species are EN (Endanger) including Order Pinales Tinyu specie in Myanmar (NBSAP 2015-2010). Tinyu plant species are overexploitation by legal and illegal logging, habit loss degradation and fragmentation by commercial plantation and appropriate land uses (MOECAF 2013). In this research, Tinyu species forests have been highly used by various purposes. Genera of *Pinus elliottii*, *Cunninghamia lanceolate*, *Glyptostrobus pensilis*, *Taxodium distichum*, *Araucaria heterophylla* are woody like habit ornamental species, among them genus *Pinusellottii* is very highly endangered level species in Myanmar (NBSAP 2015-2010). *Platycladus orientalis*, *Platycladus horizontalis*, *Juniperus chineensis*, *Juniperus sabira*, *Juniperus horizontalis* are shrubs small tree habit. These species are utilization of ornamental for landscaping species. All these species were made by illegally wildlife trade in this region (MOECAE 2013).The soil erosion and landside destroy caused by Tinyu deforestation in region. The basic needs of human awareness still keep on future forest generation. The population of Myanmar is highly dependent on natural resources and ecosystem services, with 66% of the

population working in agriculture, and much of the remainder of the rural work force involved dependent forestry resources. Poor and vulnerable members of society and ethnic nationalities the unsustainable exploitation of resources will be impact vulnerable members of the biodiversity services. Myanmar's Tinyu forests will suffer by continuous degradation at a scale by local communities. A large-scale of Tinyu forest deforestation status must be faced multiple challenges for region environment. This research highlights the notable Tinyu forest conservation management and reforestation status in region, Myanmar.

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