CHAPTER I

INTRODUCTION

Lichens have excited great interest with regard to their biological nature, botanical classification and chemical composition. The term 'lichen' (= leprous) appears to have a Greek origin and was used by Theophratus in his "History of Plants" to describe the superficial growth on the bark of olive trees. Dioscorides applied it to true lichens because of their apparent resemblance to the cutaneous disease for which they were considered to be specific. The true nature of lichens was not fully realised until 1867 when the Swiss botanist Schwendener first published the dual hypothesis of the structure of lichens and this stimulated interest in this group of plants (Neelakantan, 1969). A lichen is a unique combination of two organisms viz., an alga and a fungus and the intimate relation between these two is usually regarded as one of symbiosis, i.e., of mutual benefit. The green alga brings about photosynthesis whereas the fungal element maintains moist conditions and elaborates special products.

Lichens are broadly divided into three types. Among the more primitive are the crustose type (e.g., *Caloplaca elegans*). They spread in flat patches over a hard substratum such as rock, bark, wood or soil. In dry weather, they shrink into a wrinkled papery crust and take a pulpy gelatinous consistency when moistened by rain or dew. More highly developed are the foliose and fruticose lichens. The former (e.g., *Parmelia tinctorum*) have leafy structures less firmly moored to their place of growth than the crustose; sometimes

they are attached only by a single central umbilicus. The fruticose lichens (e.g., *Usnea orientalis*) develop from a based in elongated stalks and strands.

Lichens are slow-growing organisms and their growth is generally dependent on the humidity of the atmosphere. But they are able to resist greater extremes of temperature and desiccation than any other group of plants. They are widely distributed on the surface of the globe from the Arctics to the Tropics. Each lichen component reproduces independently, the alga by cell division and the fungus (if an ascomycetes) by ascospores produced in asci contained in cuplike or disk-shaped structure on the thallus or on specialized stalks. The ascospores are dispersed by wind; falling on a suitable substrate, they germinate, forming hyphae. A more certain method of reproduction is the production of soredia, which are compact masses of hyphal filaments and algal cells. The advantage is obvious because the fungus and the alga are dispersed as a unit. Soredia are often produced in such great numbers that the thallus has a mearly appearance. Lichens also reproduce by fragmentation; a part of the thallus may be broken off and carried away by the wind.

Usnea, a considerable genus of the ascolichens of the family Usneaceae, found all over the world (Burkill, 1935),thallus fruticose, much branched, bushy, erect, pendent or tailing, often with a distinct base, terete with a tough central core. Apothecia lecanorine, sub-terminal. Spores colourless, simple 8 per ascus (Dobsson, 1979). Branches terete to angulate and rigided, rarely flattened, differentiated into cortex, medulla, and cartilaginous axis. Spinules (up to 3 mm long) and fibrils (longer and may develop from spinules) developed laterally from branches. Papillae hemisperical, conical, or cylindrical, composed mainly of cortical tissue. Tubercles commonly larger, containing medullary tissue connecting with the medulla of the branch. Pseudocyphellae nearly always present on apex

of tubercles and common also on plane cortex of branches, sometimes becoming erose and shedding medullary fragments or soredia. Pigments varying from shades of red to stramineous may occur in the cortex or the medulla or both, or be strictly periaxial. A dark brown to black pigment sometimes in cortex near holdfast. Soredia may be primary, erupting through the cortex, and then are usually markedly excavate; or they may be secondary, originating in pseudocyphellae, then often remaining convex. Isidia may be produced from the cortex, from soredia, or from pseudocyphellae. Apothecia initiated laterally but may finally appear lateral or terminal on branch; thalline margin bearing a fringe of fibrils ('cilia'). Usnic acid in varying amounts is produced in the cortex of most species (Motyka, 1936; Dodge, 1956; Swinscow & Krog,1974, 1975, 1976, 1978, 1979, 1986).

According to the Kew Bulletin vol. 19 (1964-1965), the 31 species of *Usnea* spp. are shown below:

Usnea amabilis Mot.

U. andina Mot.

U. brasiliensis (A. Zahlbr.) Mot.

U. caespitia Mot.

U. columbiana Mot.

U. concinna Stirton

U. durietzii Mot.

U. finckii A. Zahlbr.

U. fruticans Mot.

U. furfurosula (A. Zahlbr.) Mot.

U. humboldtii A. Zahlbr.

U. jamaicensis Ach.

U. meridionalis A. Zahlbr.

U. roccellina Mot. var. *glacialis* (A. Zahlbr.) Mot.

U. roccellina var. *roccellina*

U. rubicunda Stirton

U. sericea Mot.

U. setulosa Mot.

U. siamensis Wainio

U. solida Mot.

U. sorediata (A. Zahlbr.) Mot.

U. spinulifera (Wainio) Mot.

U. splendida Mot.

U. steineri A. Zahlbr.

U. subcomosa (Wainio) Wainio

U. subgracilis Wainio

U. subhirta (Wainio) Mot.

U. subscabrosa Mot.

U. sulcata Mot. var. *sulcata*

U. tenuis Mot.

U. transitoria Mot.

Utilization of this genus has been reported in many countries (Burkill, 1935). In European medicine, until the eighteenth century, *Usnea* used as an astringent, under the names of *Muscus arboreus* and *Muscus arboreus quercinus*. The use came down from ancient times, Theophrastus for instance, mentions the lichen as the substances called 'phaskos', which resembles rags, and hangs from the branches of the Turkey Oak; and

Dioscorides was interpreted by his commentators as ascribing to it medicinal virtues. From Greek medicine it went into that of the Arabs, though the difficulty of procuring it in a dry climated must have tended to its neglect. It is impossible to ascertain if Arab medicine in any way introduced its use to the Malays; perhaps not at all.

Usneas are used throughout the Malay Archipelago, and in a great variety of ways. Being astringent they may do good in intestinal troubles, such as diarrhoea and dysentery and their use is both very reasonable and extensive. Beyond this, they have many unreasonable uses. The source of some of these uses is the idea that the lichen swaying and collecting moisture, as they do so conspicuously on mountain passes, are filtering the wind; therfore, because so many diseases are considered to be carried by the air, the lichens, it is held, may filter out the contagion as they do the moisture. By this reasoning, they may be used for all diseases. From acting as traps for flying venom (evil spirits), it is assumed that they may be actually repellant. For instance, K. Heyne (1927) recorded that they may be used in fumigating a house with the intention of driving out evil spirits and Malays are recorded as using them in the same way.

Ridley (1906) recorded this use for bronchitis. In the Medical Book of Malayan Medicine (Gard. Bull., 1930) *Usnea* enters into a mixture, which from the names of some of the other ingredients, may be of Indian origin, given as tea to a man with an uncertain illness of no apparent cause. It enters into the common Singapore tonic - a very variable decoction made from anything which may do good. It is given after childbirth (Ridley, 1897), not only in Malaya, but in Borneo and probably elsewhere.

The Malays use it externally in applications to the abdomen. One such application is in a poultice with *Paederia*, *Parkia* and onions for stomach- ache; another, from the Medical Book of Malayan Medicine is in a poultice of *Alocasia*, banana roots and oil for discoloured skin.

Usneas dye a dull orange, like the better known lichen dye, *Lecanora*. Rumpf mentions that one was used among the wealthy of Ternate, as a rouge, in a mixture with *Curcuma* and rice-powder.

In Martindale, the extrapharmacopoeia (1989) mentioned that there are proprietary preparations of *Usnea barbata* for instance :

* Omnigran^{R} (Keimdiat, Ger : Thomson & Joseph, UK)

  Ground lichen, *Usnea barbata*. For use in pharmaceutical and cosmetic preparation.

* Usnagran-A^{R} (Keimdiat, Ger : Thomson & Joseph, UK)

  An alcoholic extract of lichen, *Usnea barbata*. For use in pharmaceutical and cosmetic preparations

* Usnagran-T^{R}

  Contains the fat-soluble and water-soluble constituents of lichen. For use in pharmaceutical and cosmetic preparations.

* Usnagran-TP^{R}

  A 1% solution of Usnagran-T in propylene glycol.

Usnea siamensis Wainio is known in local name in Thailand as Foi-lom ฝอยลม (General) (เต็ม สมิตินันทน์, 2523). It is fruticose lichen, up to 5 m. long, greyish-green strands hanging from the branches of trees (figure 1).

Usnea siamensis Wainio, only one species which is reported to be found in Thailand. It often called Old man's beard, is found especially in the northern and north-eastern part of Thailand in montaine forest or at the edge of hill slope, at medium altitudes (1000-1300 m.). Previously, there have been no reports on phytochemical studies of this plant. In Thailand, all parts of *Usnea siamensis* Wainio have been used in folk-loric medicine as bitter tonic, carminative, antidiarrhoea, antidysentery and anti-tumor (หน่วยงานศึกษาค้นคว้าสมุนไพร, 2525).

On phytochemical screening, it was found that crude extract of the whole plant exhibit positive results with anisaldehyde and 10% sulfuric acid in alcohol. Hence it is indicated the presence of many compounds.

Accordingly, this present investigation deals with extraction, isolation and elucidation of compounds in the whole part, in order to contribute our knowledge of the constituents containing in this species and to search for actual yield and biological activities by quantitative and antibacterial evaluation.

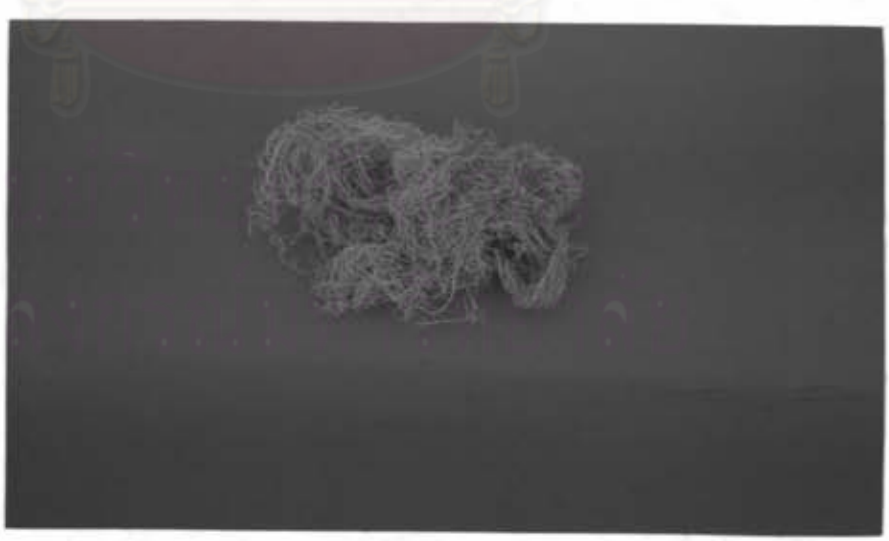

Figure 1 *Usnea siamensis* Wainio