CHAPTER I

INTRODUCTION

1.1 Introduction.

Dyeing is an ancient art which predates written records, its history can be traced back at least 4000 years [1]. Up to the middle of the nineteenth century only natural dyes were available. Then in 1856, W.H. Perkin discovered aniline dye. Here after, synthetic dyes slowly began replacing natural dyes [2]. In general, most dyes used for textile dyeing are organic compounds, which possess following characteristics; intense colour, solubility in aqueous solution ability to be absorbed and retained by the substrate, and colour fastness [3]. For any dyes to be classified as natural dyes, it shall be extracted from vegetative matter or animal residual. The natural dyes may have, a wide range of shades, which can be obtained from various parts of plants including roots, barks, leaves, flowers and fruits [4]. They normally require mordants, which are metallic salts of aluminum, iron, chromium, copper and others, for ensuring the reasonable fastness of the colour to sunlight and washing [5]. Lately, there has been increasing interest in the natural dyes, as public becomes aware of ecological and environmental problems related to the use of synthetic dyes. As the use of natural dyes cuts down significantly on amount of toxic effluent resulting from the synthetic dye process.

In order to understand its chemical structure, the chemistry of some important natural colouring matters is summarized in Table 1.1 [6].

Table 1.1 The important natural colouring matter. [6]

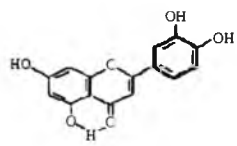
Colour	Class	Typical Dyes	Structure Name	Source
Yellow	Flavone	Weld	 Luteolin	Seeds, Stems and leaves of the *Reseda luteola L plant*

Table 1.1 The important natural colouring matter. (Continued)

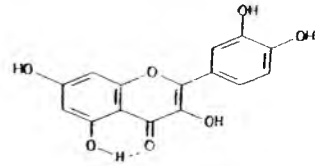
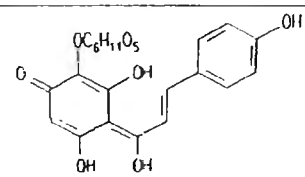
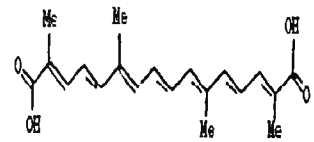
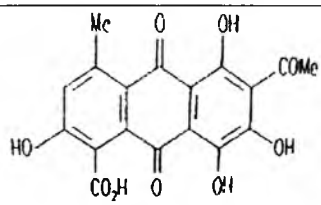
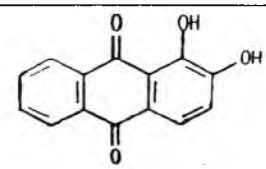
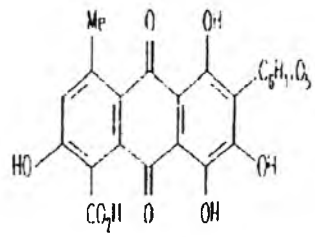
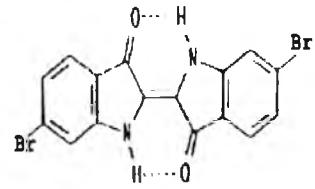
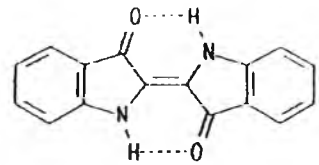
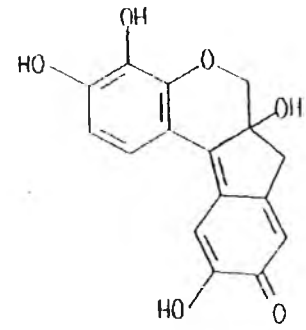
Colour	Class	Typical Dyes	Structure Name	Source
Yellow	Flavonol	Quercitron	 Quercetin	Bark of North American oak, *Quercus tinctoria nigra*
Yellow	Chalcone	Safflower	 Carthamin	Dried petals of *Carthamus tinctorius*
Yellow	Polyene	Saffron	 Crocetin	Stigmas of *Crocus sativus*
Red	Anthra-quinone	Kermes	 Kermesic acid	Female scale insects, *Coccus ilicis*, which infect the kermes oak.
Red	Anthra-quinone	Madder or Alizarin	 Alizaline	Root of the *Rubia tincto rum* plant
Red	Anthra-quinone	Cochineal	 Carminic acid	Female insect, *Coccus cacti*, which lives on cactus plants of the Prickly Pear Family found in Mexico

Table 1.1 The important natural colouring matter. (Continued)

Colour	Class	Typical Dyes	Structure Name	Source
Purple	Indigoid	Tyrian Purple	 6,6-dibromoindigo	Mollusc (i.e. shellfish) *usually Murex brandaris* plentiful in the Mediterranean
Blue	Indigoid	Woad; Indigo	 Indigo	Leaves of indigo plant, *Indigofera tinctolia L*
Black	Chroman	Logwood	 Haematin	Heartwood of the tree *Haematoxylon campechiancum L* found in Central America (The colourant is red but in combination with Cr(VI) it gives black shade)

After the discovery of synthetic dyes, natural dyers virtually stopped using the natural dyes dues to many advantages of the synthetic dyes have to offer. This includes improved colour fastness, cost reduction and simplified colour matching. Overall, it was a more reliable and easier dyeing method [7]. Despite these benefits, Thai natives still use natural dyes in home industries as well as in handicraft works. In Thailand, a number of different types of plants are employed for dyeing [8]. A list of such natural dyes used is given in Table 1.2 [7].

Table 1.2 The important natural dyes in Thailanc.

Thai name	Botanical name	Family	English	Usaged part	Colour
Eucalyptus	*Eucalyptus gunnii*	Euphorbiaceae	Eucalyptus leaves	Leaf, Bark	Yellow, Brown light beige.
Hu-kwaang	*Terminalia catappa linn.*	Combretaceae	Dear ear	Leaf	Yellowish green
Kanoon	*Artocarpus heterophylla*	Moraceae	Jack fruit	Hardwood	Yellow
Kham Foi	*Carthamus tinctorius*	Compositae	Saf flower	Flower	Red
Khamin Chan	*Curcuma longa*	Zingiberaceae	Turmeric	Rhizome	Yellow
Khraam	*Indigofera tinctoria*	Papilionaceae	Indigo	Leaf	Dark blue
Krang	*Cocus lacca*	-	Lac	-	Red or red-purplish
Kum-saet	*Bixa orellana*	Bixaceae	Annatto or Lipstick	Seed	Orange
Ma Klua	*Diospyros mollis*	Ebenaceae	Ebony	Seed pot or fluit	Black
Mai Alang (Nonsi)	*Peltophoum dasyrachrr. kurr*	Leguminosae	-	Hardwood	Pink or red

Table 1.2 The important natural dyes in Thailanc. (Continued)

Thai name	Botanical name	Family	English	Usaged part	Colour
Mai Kae	*Cudriana javemensis*	Moraceae	-	Hardwood	Yellow
Mai Lidmai	*Indicum vent*	Bignoniaceae	Bones, Ind an Trumpet	Hardwood	Brown
Sa Mor (fruit)	*Terminalia chebula Retz.*	Combretaceae	Myrobalan Wood	Fruit	Tan
Si Siad	*Acacia catechu*	Leguminosae	Betel Palm, or Cutch	Hardwood	Brown
Yo Pa or Yo	*Morinda coreia*	Rubiaceae	Madder fam	Root, bark, wood	Red
Mai Daeng	*Xylia xylocarpa*	Leguminosae	Iron Wood	Bark	Brown
Mai Fany	*Caesalpinia sappan*	Leguminosae	Sappan Wood	Hardwood	Pink or red
Mai Pradoo	*Pterocarpus indicus*	Papilionaceae	Burmese Ebony	Hardwood	Brown
Mai Sa Mor	*Terminalia chebula*	Combretaceae Chebula Rets	-	Hardwood	Red-brown
Sa Douw	*Agaditachta Indica A., luss. Var. Siamensis Vakton*	Meliaceae	Neem Tree	Leave	Yellowish green

One of the plant uses for dyeing is Eucalyptus, although Eucalyptus has been used in paper industry, oil eucalyptus and textile dyeing for several years the dyeing technique including effect of temperature, time, mordant, type of solvent, ratio of solvent and material have not yet been reported in the literature. Thus the main purpose of this work is to study extraction from eucalyptus leaves and bark as well as applying the compounds obtained on silk and cotton fabric.

1.2 Objectives

1.2.1 Search for the appropriate condition for extracted dye from the leaves and bark of eucalyptus.

1.2.2 Search the appropriate method for silk and cotton fabric dyeing from extracted dye.

1.2.3 Study effects of mordants in dyeing process.

1.2.4 Study the influences and effects of dyeing factor such as temperature, time and pH value.

1.2.5 Study quality of silk and cotton fabric after dyeing such as colour fastness to washing, colour fastness to rubbing, colour fastness to perspiration and colour fastness to water.

1.3 Scope of the research

The scope of this research work involves the dye extraction from the leaves and bark of eucalyptus and application on silk and cotton fabric then observes the effect of various parameters in extraction and dyeing. The stepwise investigation was carried out as follows.

1.3.1 To do literature survey for related research work.

1.3.2 To prepare the soxhlet extractor, materials and chemical reagent.

1.3.3 Search for the suitable condition for dye extracted parameter *e.g.* temperature, type of solvent, time and ratio of material and solvent

1.3.4 Search for the appropriate condition for dyeing on silk and cotton fabric parameter *e.g.* type of mordants, temperature, time, liquor ratio and pH value.

1.3.5 To determine the colour fastness properties *e.g.* colour fastness to washing, colour fastness to light, colour fastness to perspiration, colour fastness to water and colour fastness to rubbing.

1.3.6 To summarize the result.