

CHAPTER I



INTRODUCTION

Pepper is one of the world's most important and oldest spices. Its aroma and pungency have been used in food industry for flavouring sausages, table sauces, canned meats and salad dressings (Buckle *et al.*, 1985). Black, white and green are the three different forms of pepper products available in the market. The two major primary products which trade internationally are black and white pepper (Rathnawathie and Buckle, 1984). Black pepper is prepared by drying the whole unripe but fully developed berries. On the other hand, white pepper is prepared from well-matured (red) berries, unripe berries being unsuitable. However, white pepper is now often prepared by decorticating fully matured and dried black pepper in specially constructed machines. Green pepper is another form of pepper which was introduced only recently in the world market and is prepared from unripe but fully developed berries which are preserved in the wet form in brine, acetic acid or citric acid (Pruthi *et al.*, 1976).

The constituents of pepper responsible for its value as food additive are volatile oil (for aroma) and alkaloids (for characteristic pungency) (Govindarajan, 1977; Purseglove *et al.*, 1981). Pepper has been reported

to contain 2-4% volatile oil, 5-9% alkaloids mainly piperine, 11% protein and up to 65% carbohydrate (Youngken, 1950). The volatile oil can be obtained by steam distillation of the dried pepper berries. It is an almost colourless to bluish-green liquid with a characteristic odour recalling that of whole pepper (Guenther, 1952). Most of pepper oil in commerce is distilled from black pepper. Oil production from white pepper is not common, due to the higher cost to the raw material and the lower oil yield. Little information is available for green pepper oil (Buckle *et al.*, 1985). Pepper oil is comprised mainly of monoterpene hydrocarbons (50-80%) with smaller amounts of sesquiterpene hydrocarbons (20-40%) which appear to possess the main desirable attributes of pepper flavour and small amounts of oxygenated terpene compounds (less than 4%) (Hasselstrom *et al.*, 1957; Ikeda *et al.*, 1962; Jennings and Wrolstad, 1961; Nigam and Handa, 1964; Richard *et al.*, 1971; Wrotstad and Jennings, 1965). A study of the aromatic substances present in pepper oil was begun during the last century but recently the composition of volatile oil has been studied by gas chromatography and other modern analytical techniques (Lewis *et al.*, 1969a). Work on the composition of volatile oil of pepper using chemical isolation and derivatization techniques could detect only a few of the major components. The pepper oil is a complex mixture of hydrocarbons, acid, ester, carbonyl compounds, alcohols and oxides (Debrauwere and Verzele, 1975). The compositional variability of black pepper oil from

different cultivars has been examined by several authors (Datta *et al.*, 1971; Lewis *et al.*, 1969a, 1969b; Richard *et al.*, 1971; Russell and Else, 1973).

The alkaloid piperine, the pungent principle in pepper, together with other pungent substances present in small quantities such as chavicine, piperidine and piperettine are responsible for the sharp biting taste and pungency. Since piperine is universally accepted as the predominant pungent principle in pepper, the quality of pepper and also of the oleoresin is dependent largely on the piperine content and thus methods for estimating piperine are becoming more important (Nambudiri *et al.*, 1970; Purseglove *et al.*, 1981; Wijesekera *et al.*, 1972). Methods available for analysis of piperine include Kjeldahl nitrogen determination (Harwitz, 1980), adaptation of the chromotropic acid test for formaldehyde (Lee, 1956), colourimetric methods using nitric acid (Graham, 1965a), sulphuric acid and aromatic aldehyde (Graham, 1965b), phosphoric acid and based on alkaline hydrolysis (Labruyera, 1966), reaction with *p*-nitrophenyl diazonium fluoborate, volumetric analysis (Shankaranarayana *et al.*, 1970), spectrophotometric analysis (Fagen *et al.*, 1955; Genest *et al.*, 1963) and high-performance liquid chromatography (HPLC) (Cleyne and Verzele, 1972, 1975; Galetto *et al.*, 1976; Verzele *et al.*, 1979).

In term of the available methods, the Kjeldahl and UV-spectrophotometric methods have been widely and

frequently practised. The Kjeldahl method, however, measures other nitrogenous compounds and always give high values (Fagen *et al.*, 1955; Galetto *et al.*, 1976; Genest *et al.*, 1963; Rao *et al.*, 1960; Tausing *et al.*, 1956). The UV-spectrophotometric method has been developed for the direct measurement of piperine and reliable under controlled conditions (Fagen *et al.*, 1955; Helrich, 1990; Galetto *et al.*, 1976; Genest *et al.*, 1963; Rao *et al.*, 1960; Tausig *et al.*, 1956). Recently HPLC was selected as a rapid, sensitive and specific method for the quantitative determination of piperine, because of its ease of operation and proven ability to detect and separate the small quantities of non-volatile, UV-active components (Cleyn and Verzele, 1972, 1975; Galetto *et al.*, 1976; Verzele *et al.*, 1979). The UV-spectrophotometric method always gave slightly higher result than did the HPLC method. Interference by other nitrogenous components such as piperettine and piperlylin may be the reason for the higher values with UV methods (Rathnawathic and Buckle, 1983).

Thai black pepper, as compared to other spices produced locally, has been a major exported spice of Thailand. Its total export value has been increased from 80 million Baht in 1987 to 165 million Baht in 1990. The major site of pepper plantation in Thailand is at Chantaburi (about 78%) (บริษัทการจัดการเกษตรและอุตสาหกรรม จำกัด, 2531). Most of Thai pepper is the product obtained from both Sarawak and Sri Lankan cultivars grown locally. Very little information is available for the pepper quality

of each cultivar used to compared with different sources (ประเทืองศรีและคณะ, 2530). Thus, Thai pepper has lower prices than other country in the world market. This study, therefore, aims to evaluate the quality of Thai pepper by carrying out the pepper oil content, composition and quatitative analysis of main components in pepper oil and piperine content in pepper obtained from each cultivar grown in Thailand.

