

## Quality Control of Luk Prakop, a Thai Herbal Combination

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### Abstract

**Luk Prakop (abbreviated LPK and pronounced “Loo Brah Kope”) is a Thai herbal combination which has been traditionally used to treat a variety of ailments including musculo-skeletal pain, urinary obstruction, skin aging, inflammation and fungal skin infections. It contains roughly three to fourteen kinds of herbs, depending on the manufacturer. A cotton bag containing these herbs is placed on a hot steam pot, which activates the herbs. It is then pressed, or ‘Prakop’ onto a painful site on the human body for the purpose of pain relief. It is thought that the active ingredients come from the essential oils of the herbs Phlai (*Zingiber cassumunar*) and Curcuma (*Curcuma longa*, *Curcuma zedoaria*). Because of the varying contents and quality of different herbal formulations, modern investigations require some form of standardization, at least for research purposes. Quality control can be performed by using a gas chromatography (GC) fingerprint of an essential oil formulation. For this purpose, GC fingerprints were obtained on specific combinations of LPK in Thailand.**

### INTRODUCTION

Since ancient times, the herbal formulation known as Luk Prakop (LPK) has been used, within and around Thailand, for the purposes of treating a variety of ailments. The wisdom of which herbs to use, how to grow and use them, and for exactly what purposes, has been passed down from generation to generation. While it is not known exactly when LPK was first used as Thai traditional medicine, there are three important reference dates:

**Pra Osoth Pra Narai:** 2203-2230 B.E. (1660-1687 A.C.)

In this text, LPK applied locally was for pain relief and it was described to have the physiological effect of vein stretching. Perhaps this could be interpreted as vasodilation. The formulation they used contained the following:

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|--|----------|
| a. Tein dum, black cumin ( <i>Nigella sativa</i> ) | 1 part   |
| b. Salt  | 1 part   |
| c. Obb cheow ( <i>Cinnanomum</i> sp.) fruit        | 2 parts  |
| d. Phlai ( <i>Zingiber cassumunar</i> )            | 4 parts  |
| e. Plub Plung ( <i>Crinum asiaticum</i> ) leaves   | 8 parts  |
| f. Tamarin ( <i>Tamarindus indica</i> ) leaves     | 16 parts |

**Thai Traditional Medicine at the Stone of Wat Phothi:** 2375 B.E. (1832 A.C.)

At the time of this text’s publication, His Majesty King Rama III (a.k.a. King Pra Nang Klow) ordered that a complete record of Thai healing practices be documented. Wat Phothi, a.k.a. Wat Pra Chetupon Vimol Mungklala Ram, was the site where the documentation occurred. At this time, LPK was also described to have therapeutic effects for urinary obstruction. Two formulations were described, but without proportions listed:

- Hua Horm (*Allium ascalonicum*)
- Chili (*Capsicum frutescens*)
- Garlic (*Allium sativum*)
- Gateu (*Zingiber zerumbet*)

- e. Grachai (*Boesenbergia rotunda*)
- f. Pak Bung (*Ipomoea aquatica*)
- g. Phlai (*Zingiber cassumunar*)

**Khampee Prathom Chindra:** 126 Ratana Kosin Year (1908 A.C.)

This third reference to the ancient wisdom of LPK was initiated by the younger brother of His Majesty King Rama III, known as Kroma Luang Dumrong Rajanuparp. He appointed the head of the Vejasamosorn School, Praya Pisanuprasatveija, to supervise the documentation of all Thai Traditional Medicine into the medical bible known as “Khampee Prathom Chindra”. It had two volumes, known as “Pat Sart Songkraow”, which roughly translates to “the practice of providing respectful healing to all people”. This text was stored in the Royal Library, which was known as Hor Pra Samud. The first edition was published on the 1<sup>st</sup> of March in the Ratana Kosin year 126. The second edition was published on the 1<sup>st</sup> of August in the Ratana Kosin year 128.

From the ancient wisdom of Thai Traditional Medicine, there are many LPK formulations, using between three and fourteen different kinds of herbs. Nevertheless, the main ingredients are Phlai (*Z. cassumunar*) and Curcuma (*C. longa*). For activation, the cotton bag containing the herbs is steamed by placing it directly over a pot of boiling water, which produces the essential oils. It is then applied to the skin, while a second bag is being steamed. The two bags are used alternatively to provide continuous treatment at the desired temperature. The function of the essential oils is to relieve pain and stretch muscle fibers. There are two kinds of curcuma either *Curcuma longa* (Ka-min-chan or Turmeric) or *Curcuma zedoaria* (Ka-min-oi or Zedoary) which can be used either turmeric or zedoary or both. Other herbs are used in the formulation, which function as a carrier and increase LPK effectiveness. The Thai Traditional Medicine Department of the Ministry of Public Health (MOPH) lists the ingredients in the following manner:

- |  |               |
|--|---------------|
| a. Phlai   | 500 gm        |
| b. Leech lime ( <i>Citrus hystrix</i> ) leaves or peel | 200 gm        |
| c. Lemon grass   | 100 gm        |
| d. Tamarind leaves                                     | 300 gm        |
| e. Turmeric  | 100 gm        |
| f. Somploi ( <i>Acacia concinna</i> ) leaves           | 100 gm        |
| g. Salt  | 1 tablespoon  |
| h. Camphor   | 2 tablespoons |

In order to have the desired outcome for the use of LPK, the raw materials must be of the highest quality. It is imperative, that the content of different formulations be analyzed and tested for quality. The objective of this work is to perform such testing and provide standardization for quality control.

**MATERIALS AND METHODS**

Three formulations of herbs were analyzed. The first is referred to as “LPK Formula 1” and contains the seven herbs. The five herbs prescribed by the Thai Traditional Medicine. The second and third formulations are referred to as “LPK Formula 2” and “LPK Formula 3” respectively. They each contain the same four kinds of herbs: phlai, curcuma, leech lime leaves and lemon grass. LPK Formula 2 comes from the author’s supply of herbs and LPK Formula 3 comes from another laboratory.

The essential oils of herbs were obtained from a supplier in Bangkok, Thailand. Most of the plants came from the province of Nakorn Pathom. Depending on the quantity of herbs available, they were individually distilled in one of two types of distillation units. Materials were distilled in either a stainless steel steam distillation bath (phlai, ginger, curcuma and leech lime) or using distillation glassware (lemon grass and wan nang-kham).

The qualitative and quantitative analysis was performed by Gas Chromatograph (GC) (Fisons 8000 series with column J & W DB 5, 30 m x 0.32 mm). The conditions were set at 70-220°C, and 40°C/min and the flame ionization detector (FID) was set at

230°C.

## RESULTS AND DISCUSSION

The yields were measured as milliliters of essential oil per kilogram of herb used. After the distillation of the seven essential oils (phlai, turmeric, zedoary, ginger, leech lime, lemon grass and wan nang-kham), the yields were 0.53, 0.29, 0.16, 0.15, 1.11, 0.20 and 0.35 ml/kg respectively.

Fig. 1, 2 and 3 are the chromatograms of the 3 formulas.

Because these depictions show both the composition and concentration of essential oils, they can be used as fingerprint, for LPK quality control. The quality of the herbs differ based on where they come from, how they are harvested, what season they are harvested, how they are prepared, how they are stored, etc. Therefore, each of the fingerprints is truly unique. While the exact timing for the steam distillation of essential oils is not considered to be essential, the way in which the activation peaks relate to one another is.

When the GC results of LPK Formulas 2 and 3 are compared, it is clear that there are differences in their retention time and peak area. However, the way in which the peaks compare to one another is quite similar. This indicates that the same kinds of herbs were used and there are of similar quality.

In future studies, different formulations of herbs can be compared for effectiveness. Those that are found to have a desired result can undergo GC analysis.

This study is limited in that it only analyzes the herbs. The Thai massage that precedes the application and the way in which the herbs are applied to the skin will certainly vary between Traditional Thai Healers. This analysis of the herbal formulations, however, is a key step in the standardization process.

## CONCLUSIONS

For research and quality control purposes, a standard method of analyzing LPK is necessary. In this study, steam distillation and gas chromatography were used to analyze different formulae. It was found that when the same kinds of herbs are compared with each other, they produce similar, but not identical, results on gas chromatography.

In future studies, if a particular formulation of LPK is found to have desired effects, its LPK fingerprint can be determined. When an attempt is made to reproduce this formulation, its accuracy can be measured by this method. This approach can tight the quality of LPK formulas.

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**Figures**

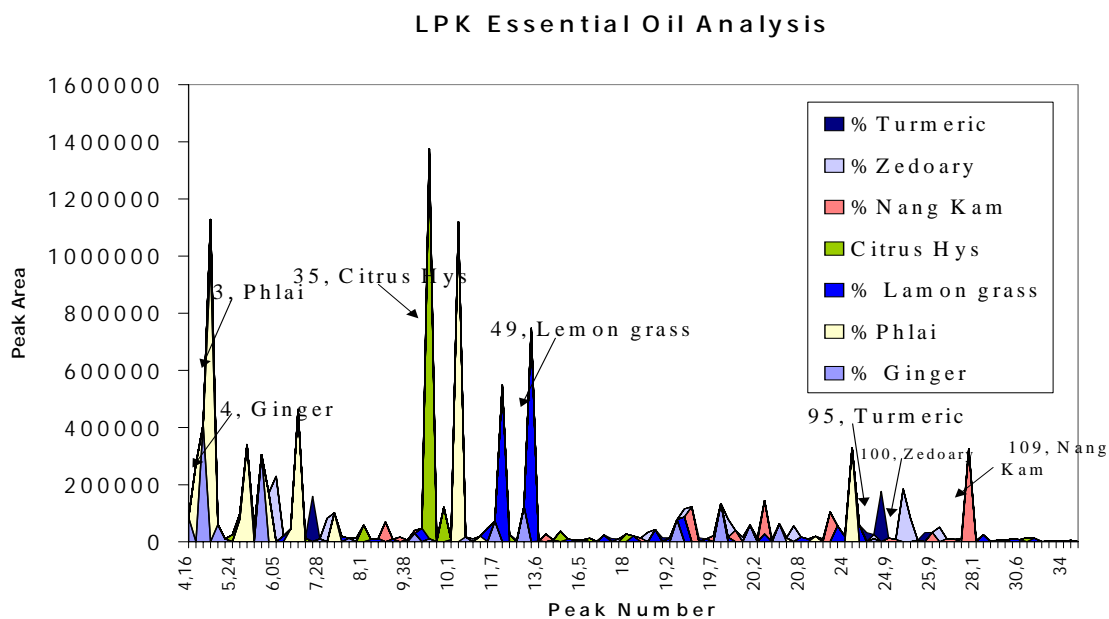


Fig. 1. Depiction of retention time vs. peak area of each of the seven essential oils in LPK Formula 1.

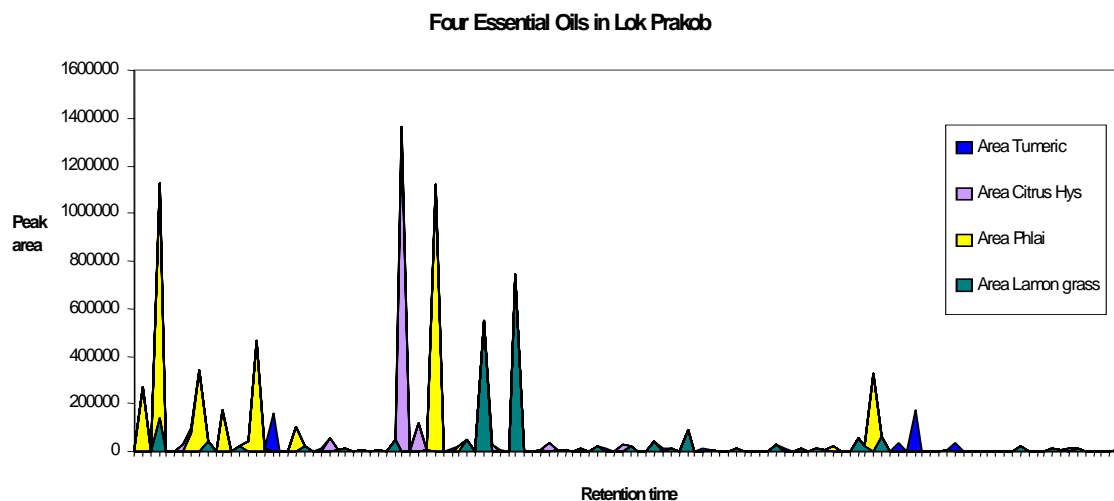


Fig. 2. Depiction of retention time vs. peak area of each of the four essential oils in LPK Formula 2.

### Analysis of Essential Oils from LPK Formula 3

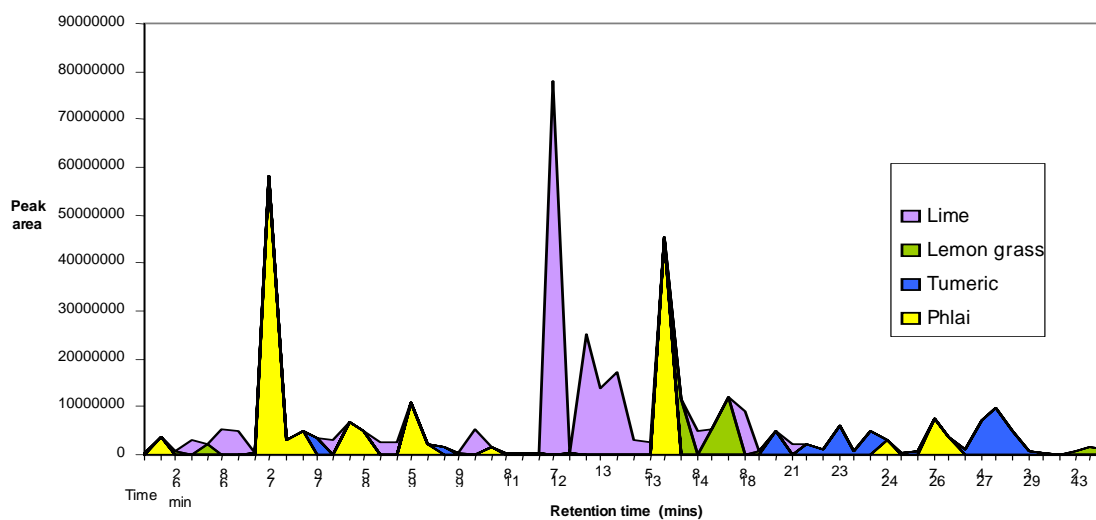


Fig. 3. Depiction of retention time vs. peak area of each of the four essential oils in LPK Formula 3. Ingredients in Luk Prakob from the other laboratory.