

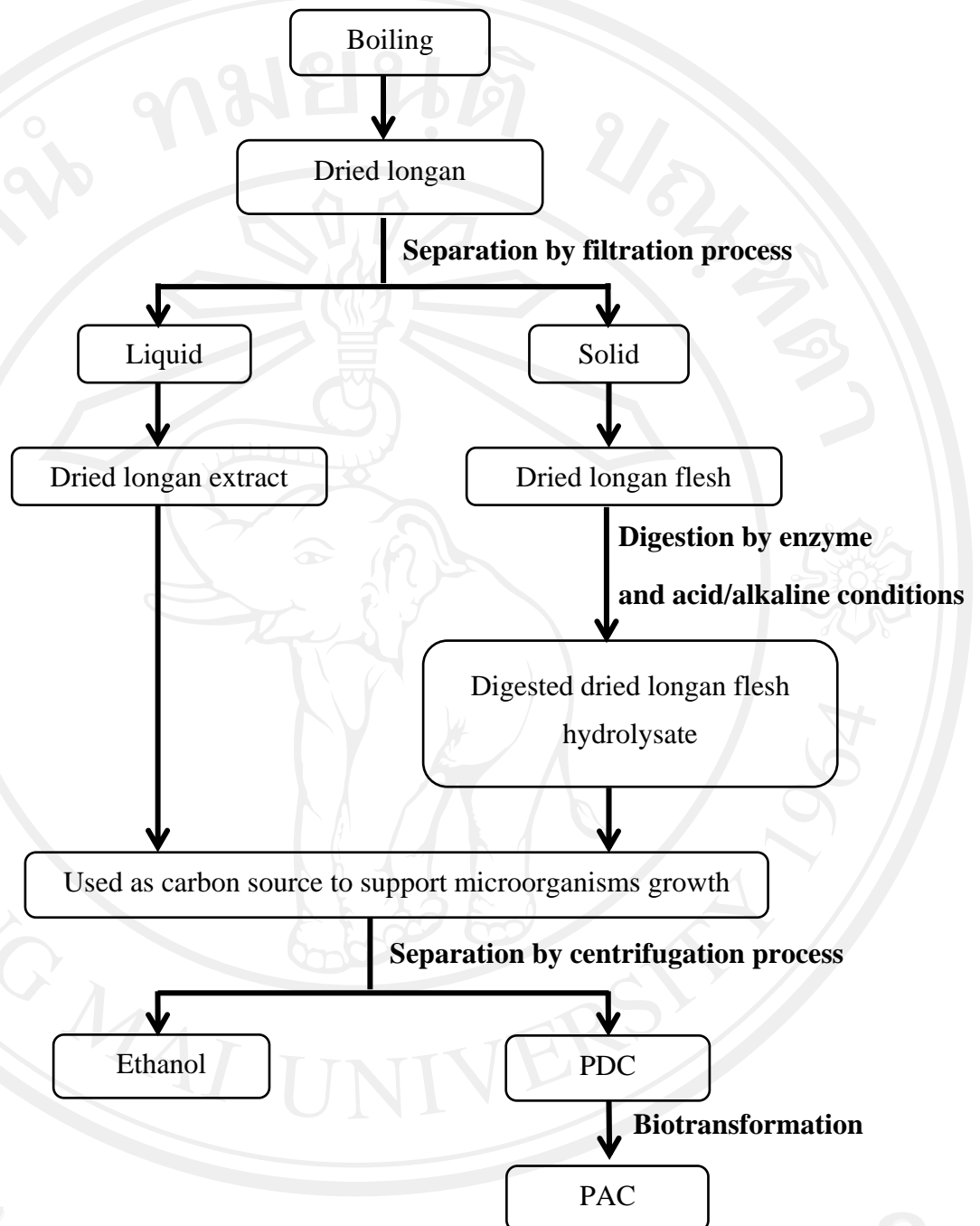




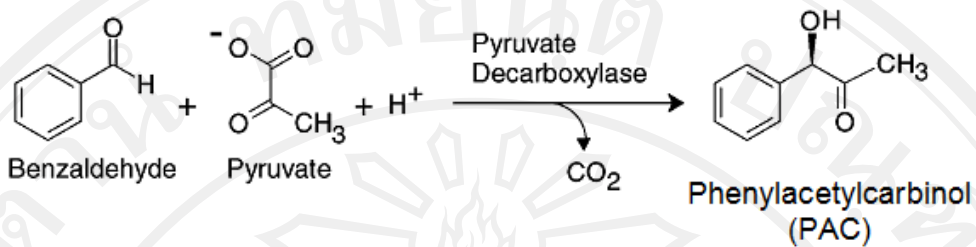
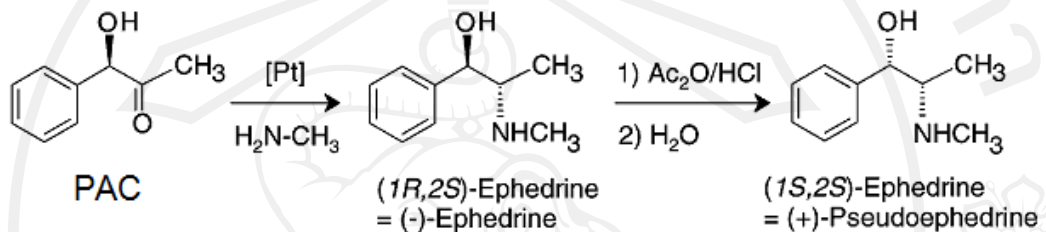
agreed upon. The mentioned project was handled by Ministry of Science and Technology and completed in May, 2010 (RYT9, 2010).

The principle composition of fresh and dried longan flesh was carbohydrate (Angasit *et al.*, 1999) which was the combination of 3 main sugars, namely, sucrose, glucose and fructose (Panyathep, 2005). These sugars were used as carbon source to support the microbial growth (Pratong *et al.*, 2007). The microbes were used to eliminate low quality dried longan by converting into high value products instead of wastage disposal. One common example was high level ethanol production from expired dried longan which was mixed with molasses prior to fermentation by yeast *Candida utilis* and *Saccharomyces cerevisiae* (Kumtip *et al.*, 2009). Low quality dried longan still possessed high level of sugars that could be used in ethanol or butanol production. Boiling extraction of dried longan would result in sugars which could be used for fermentation to achieve alcohol and left over dried longan flesh. The latter must be utilized for useful proposes to achieve zero waste process as shown in Figure 1.2.

One way to solve the problems would be emphasized on sugars extraction from dried longan as carbon source for microbial growth with the potential of production ethanol. In addition, the remnant microbial biomass also contained pyruvate decarboxylase (PDC) enzyme which could be utilized for the biotransformation of benzaldehyde and pyruvate to valuable chemicals such as phenylacetylcarbinol (PAC) in a well – known Knoll procedure (Hildebrandt and Klavehn, 1934; Hildebrandt and Klavehn, 1932). Chemicals methods would follow to convert phenylacetylcarbinol into high value pharmaceutical compound – ephedrine which could be used to relieve asthma symptom. This was achieved by amination process ( $\text{CH}_3\text{NH}_2$  -) that was catalyzed by Platinum (Pt). Conversion to pseudoephedrine – a nasal decongestant – was also possible by acetic anhydride, hydrochloric acid ( $\text{Ac}_2\text{O}/\text{HCl}$ ) and water (Rosche *et al.*, 2002) as shown in Figure 1.3. The selling prices of ephedrine hydrochloride and pseudoephedrine hydrochloride in Thailand were 4,450 and 2,000 Baht per kg, respectively (FDA Thailand, 2007).



**Figure 1.2** Summary of research direction to fully utilize dried longan in ethanol and PAC production

**BIOTRANSFORMATION:****CHEMICAL SYNTHESIS:**

**Figure 1.3** Biotransformation of benzaldehyde and pyruvate into phenylacetylcarbinol (Leksawasdi, 2004)

**1.2 Objectives**

- 1.2.1 To determine the appropriate conditions for digesting post – extracted dried longan flesh with low sugar level so that the higher level of sugars content can be achieved and utilize as an alternative carbon source for the microorganism with ethanol producing capability.
- 1.2.2 To compare the growth kinetics of *S. cerevisiae* TISTR 5606, *C. utilis* UNSW 709400, as well as UNSW 709700 using dried longan extract and dried longan flesh residue digested with the appropriate condition from 1.2.1 as the carbon source.
- 1.2.3 To compare PAC production levels from whole cells obtained from three microbial strains in 1.2.2 using the two – phase emulsion system.

### 1.3 Experted benefits

- 1.3.1 Obtain the appropriate digestion condition for low – sugared dried longan flesh residue in order to achieve higher sugar level which can be used as carbon source for the ethanol production microorganisms.
- 1.3.2 Obtain growth kinetics of *S. cerevisiae* TISTR 5606, *C. utilis* UNSW 709400, as well as UNSW 709700 using dried longan extract and dried longan flesh residue extract digested by the appropriate conditions obtained from 1.3.1 as the carbon source.
- 1.3.3 Obtain the comparison information of PAC production levels between whole cells from three microbial strains from 1.3.2 in the emulsion two – phase system.

### 1.4 Scope of the study

The carbon sources used for the microorganism cultivation were dried longan extract and dried longan flesh residue extract which were cv. Daw in the area of Chiang Mai and Lamphun provinces.