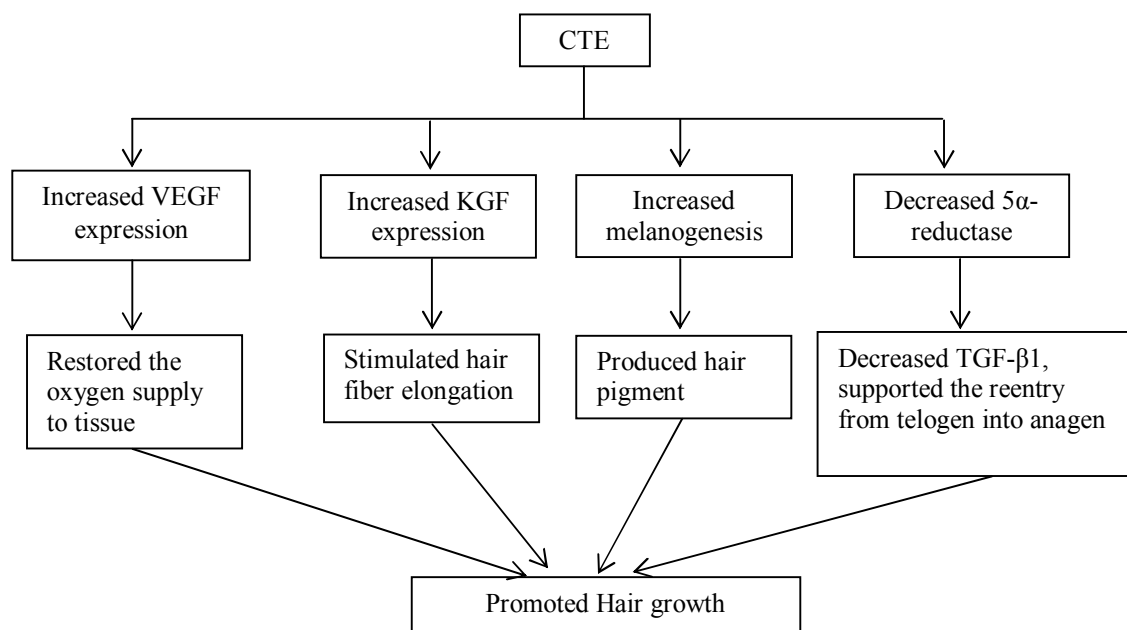


CHAPTER VI

CONCLUSION

Due to a great impact of hair loss on a person's self-respect, mental health, and overall quality of life, the purpose of this study is to search the high potential herbal plant for hair growth promotion. Among 15 plants, *Carthamus tinctorius* floret extract showed the highest proliferative effect on hair growth related-cells including dermal papilla cells and keratinocytes. Therefore *C.tinctorius* was selected for further study. Among four different methods of extraction, the 50% ethanolic extract (CTE) was the most appropriated to be used because it revealed the highest proliferative effect, low toxicity on hair growth related-cells as well as high value of extraction yield.

The safety evaluation of CTE demonstrated that it had no toxic on human white blood cells and no mutagenic activity in *Salmonella typhimurium*. Therefore, the CTE was further investigated for the hair growth promoting activity both *in vitro* and *in vivo*. *In vitro* study demonstrated that CTE promoted the expression of vascular endothelial growth factor and keratinocyte growth factor with dose- and -time dependent manner. CTE also inhibited the expression of hair loss related-genes including transforming growth factor β -1, 5 α -reductase Type I and 5 α -reductase Type II. In addition, CTE simulated the melanin production in cultured melanocytes and the expression of melanogenesis related genes including tyrosinase, tyrosinase related protein I and tyrosinase related protein II. Moreover, CTE significantly increased in hair follicle length in cultured hair follicles. All of the results suggested the potential of CTE on hair growth and the effect of CTE was similar to the commercial drug, minoxidil. The *in vivo* studies of the hair growth promoting effect of CTE in both mice and rats suggested the potency of CTE on hair growth. The re-growth rate of shaved-animal hair of CTE treated-group was higher than that of control group. The finding demonstrated the local effect of CTE to promote the hair growth. Moreover, *in vivo* studies also confirmed the safety of CTE due to during the application period, the irritation, the differences in average body weight between treatment and non-treatment groups or abnormalities in the animal were not observed. From all results, the hair growth promoting effect of CTE can be concluded as follows



Although, CTE contained several phenolics compounds including quercetin, *p*-coumaric acid and vanillin, however, in term of the quality control of CTE, hydroxysafflor yellow A was successfully used as a chemical marker. In addition, the preliminary skin permeability demonstrated that CTE could permeate well through the pig ear skin.

Therefore, CTE is a good candidate for hair growth promoting product development. Moreover, this study could be the experiment pattern for other hair growth promoting substances.