Antityrosinase and antioxidant activities of selected Thai herbal extracts

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Abstract

Tyrosinase inhibitors and antioxidants have been used in cosmetics as skin whiteners. The aims of the present study were to test the anti-tyrosinase and antioxidant activities of Thai herbal extracts in indigenous use as skin toneres. Eight Thai herbal extractes were investigated using the dopachrome method for assaying anti-tyrosinase and the DPPH free radical scavenging activity for assaying antioxidant activity. *Garcinia Mangostana* Linn. *Trigonostemon reideoides.* and *Curcuma aromatica* Salisb. extracts showed strong anti-tyrosinase acitivity with percentage tyrosinase inhibition values of 74.55, 50.23 and 42.45 respectively while *G. mangostana* Linn, *Nelumbo nucifera* Gaertn. and *T. reideoides.* extracts showed high antioxidant activity with the EC_{50} values at concentrations of 4.03 ,4.88 and 7.52 μg/ml, respectively. In conclusion, the herbal extracts of *G. mangostana* Linn , *T. reideoides.*and *N. nucifera* Gaertn. have potential for use as skin whiteners in cosmetic formulations.

Keywords: Anti-tyrosinase activity , Antioxidant activity, *Garcinia mangostana*, *Trigonostemon reideoides*

1. Introduction

Tyrosinase inhibitors have been used in cosmetics as skin whiteners (Kadekaro et al., 2003). Additionally, antioxidants have also been used in cosmetics due to their prevention or delaying pigmentation by various mechanisms (Seo et al., 2003). It is of interest to know whether traditional herbal medicine used cosmetically have antityrosinase and antioxidative activities. They could be useful in modern formulations comprised of herbal extracts as skin whitening preparations due to having less toxicity. The aims of the present study were to test the anti-tyrosinase and antioxidative activities of some Thai herbal extracts used for skin creams in indigenous use.

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2. Experimental

2.1. Plant materials

The plant samples e.g. *Curcuma aromatica* Salisb.(rhizhome), *Garcinia mangostana* Linn. (hull), *Hibiscus sabdariffa* Linn. (flowers), *Trigonostemon reideoides* (Kurz) Craib (root), *Eurycoma longifolia* Jack. (root), *Nelumbo nucifera* Gaertn. (stamen), *Aspidistra sutepensis* K. Larsen (rhizhome) were extracted with 95 % ethanol by maceration method. The solvent was evaporated by rotary evaporator yielding the herbal extracts. The extracts were kept at 4 ^{o}C.

2.2. Tyrosinase inhibition assay (Nam-Ho Sh et al., 1998)

Tyrosinase inhibition assay was performed by dopachrome method with some applications (Zhang JP., et al, 2006). Briefly, the extracts were dissolved in distilled water at a concentration of 10 % w/v. The 4 test tubes (A,B,C,D) were used for each extract. One mL of 2.5 mM L-DOPA and 1.8 mL of 0.1 M phosphate buffer (pH 6.8) were added to each tube, then incubated at room temperature for 10 minutes. After incubation, reagents were added to each tube as follows; Tube A (0.1 mL water, 0.1 mL tyrosinase enzyme 605 unit/mL), tube B (0.2 mL water), tube C (0.1 mL tyrosinase enzyme, 0.1 mL herbal extract), tube D (0.1 mL water, 0.1 mL herbal extract). After incubation at room temperature for 25 minutes, each tube was monitored by measuring the change in absorbance due to the formation of the DOPAchrome using a UV spectrophotometer at 492 nm. Percentage of inhibition of tyrosinase activity was calculated as follows : % Tyrosinase inhibition = (A-B)-(C-D)/ (A-B) x 100 where A,B,C,D were the absorbances of mixture in tubes A,B,C,D, respectively. Kojic acid at a concentration of 1 % was used as the positive control.

2.3. Antioxidant Activity assay : DPPH free radical scavenging activity

The free radical scavenging activity of extracts and the standard ascorbic acid solutions in absolute ethanol were determined based on their ability to react with the stable DPPH (1,1-diphenyl-2-picryl hydrazyl) free radical (Yamasaki et al., 1994). A 750 µL aliquot of the extract (50 to 1000 µg/ml, dissolved in absolute ethanol) was added to 750 µL of DPPH in absolute ethanol (152 µM). After incubation at room temperature for 20 minutes, the absorbance of each solution was determined at 520 nm using a UV spectrophotometer. Percentage inhibition and the concentration of sample required for 50% scavenging of the DPPH free radical (EC50) were determined. Ascorbic acid was determined by the same method as the reference standard.

3. Results and discussion

The inhibitory effects of tyrosinase by the herbal extracts are summarized as shown in Table 1. The three strongest tyrosinase inhibitors were the herbal extracts from *G. mangostana* Linn. *T. reideoides.* and *C. aromatica* Salisb. respectively, with the percentage of tyrosinase inhibition at the values of 74.55, 50.23 and 25.30 respectively. The three strongest anti-oxidant scavenging activities were exhibited by the herbal extracts of *G. mangostana* Linn, *N. nucifera* Gaertn. and *T. reideoides* with the EC_{50} values at concentractions of 4.03,4.88 and 7.52 mg/ml, respectively (Table 2). The high antioxidant activity of the extract of *G. Mangostana* and *H. sabdariffa* Linn. were similar to the results of Limei Yu (Limei Y et al., 2007) and K.R. Christian (K.R. Christian et al., 2006), respectively.

Table 1 Tyrosinase inhibitory activity of the herbal extracts

Plant family	Plant name	% Inhibition
Zingberaceae	*Curcuma aromatica* Salisb.	25.29
Nelumbonaceae	*Nelumbo nucifera* Gaertn.	26.05
Simaroubaceae	*Eurycoma longifolia* Jack.	25.84
Liliaceae	*Aspidistra sutepensis* K. Larsen	39.34
Rutaceae	*Hesperethusa cernulata* Roem.	39.60
Malvaceae	*Hibiscus sabdariffa* Linn.	42.45
Euphorbiaceae	*Trigonostemon reideoides* (Kurz) Craib	50.22
Guttiferae	*Garcinia Mangostana* Linn.	74.55
1% Kojic Acid		60.37

Table 2 Anti-oxidant activity of the herbal extracts

Plant family	Plant name	EC 50 (μg/ml)
Guttiferae	*Garcinia Mangostana* Linn.	4.03
Nelumbonaceae	*Nelumbo nucifera* Gaertn.	4.88
Euphorbiaceae	*Trigonostemon reideoides*	12.05
Zingberaceae	*Curcuma aromatica* Salisb.	12.05
Malvaceae	*Hibiscus sabdariffa* Linn.	15.60
Liliaceae	*Aspidistra sutepensis* K. Larsen	27.33
Rutaceae	*Hesperethusa cernulata* Roem.	45.59
Simaroubaceae	*Eurycoma longifolia* Jack.	58.10
Ascorbic acid		1.83

Conclusion

This present study indicates that the herbal extracts of *G. mangostana* Linn., *T. reideoides* and *N. nucifera* Gaertn. have high potential to be further developed as skin whiteners in cosmetic formulations by nanotechnology.

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