

RESEARCH ARTICLE

Nutritional Composition, Capsaicin Content and Enzyme Inhibitory Activities from “Bang Chang” Thai Cultivar Chili Pepper (*Capsicum annuum* Var. *acuminatum*) after Drying Process

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Received: 10th March, 2023; Revised: 25th June, 2023; Accepted: 18th August, 2023; Available Online: 25th September, 2023

ABSTRACT

Chili pepper cultivars come in a broad variety of tastes, colors, sizes, and spiciness levels due to various growth conditions. The significance of different chili peppers and other spices in Thai cuisine may be seen in dishes. This study evaluated the nutritional composition and capsaicin content from “Bang Chang” Thai cultivar chili pepper after drying, and the inhibition of lipase, tyrosinase and elastase enzymes from its oil and ethanol extracts. The nutritional composition of sun-dried chili pepper was high dietary fiber and beta-carotene, which were significantly high amount portion of Thai recommended dietary intake (RDI). According to calculations and definitions, “Bang Chang chili pepper” is a non-pungent *Capsicum* (0-700 SHU) since it contains a low amount of capsaicin. Total phenolic content was more abundant in ethanol extract (2.50 ± 0.13 mg GAE/g) than oil extract (1.05 ± 0.05 mg GAE/g). Compared to the positive control orlistat ($IC_{50} = 3.26 \pm 0.28$ mg/mL), an anti-lipase drug, ethanol extract was 2.0 times more lipase inhibitory. In addition, ethanol extract was mildly anti-tyrosinase, while oil extract was non-activity. The anti-lipase activity of ethanol extract was due to phenolic content rather than capsaicin contained and this enzyme inhibition may act on active site. We found that ethanol extract of “Bang Chang” cultivar chili pepper yielded higher TPC content and more effective anti-lipase than oil extract. The finding provided benefits on applying this chili pepper on anti-lipase use and weight management.

Keywords: *Capsicum annuum* var. *acuminatum*, Chili pepper, Anti-lipase, Anti-tyrosinase.

International Journal of Pharmaceutical Quality Assurance (2023); DOI: 10.25258/ijpqa.14.3.41

How to cite this article: Petcharaporn K, Thongkao K, Thongmuang P, Sudjaroen Y. Nutritional Composition, Capsaicin Content and Enzyme Inhibitory Activities From “Bang Chang” Thai Cultivar Chili Pepper (*Capsicum annuum* Var. *acuminatum*) After Drying Process. International Journal of Pharmaceutical Quality Assurance. 2023;14(3):707-711.

Source of support: Nil.

Conflict of interest: None

Table 1: Nutritional composition and capsaicin content of Bang Chang” cultivar chili pepper

<i>Nutrition value</i>	<i>Unit</i>	<i>Per 100 g</i>	<i>Per serving size</i>	<i>RDI (%) *</i>
Energy	kcal	62.48	60	-
Energy from fat	kcal	3.24	0	0
Total fat	g	0.36	0	0
Saturated fat	g	0.08	0	0
Cholesterol	mg	ND	0	0
Protein (%N × 6.25)	g	2.19	2	-
Total carbohydrate	g	12.62	13	4
Dietary fiber	g	5.08	5	20
Sugar	g	3.05	3	-
Sodium	mg	12.64	15	1
Vitamin A	µg	261.14	(261.14)	35
Beta-carotene	µg	1566.85	(1566.85)	-
Vitamin B1	mg	0.053	(0.05)	4
Vitamin B2	mg	0.145	(0.14)	8
Calcium	mg	15.70	(15.70)	<2
Iron	mg	0.59	(0.59)	4
Capsaicin	mg/100 mL	0.018	-	-

*Recommended dietary allowance (RDI) is according to Ministry of Public Health, Thailand³⁵

ND = not determined

Table 2: Total phenolic content and enzyme inhibitory activities of dried pepper extracts

<i>Sample/Assay</i>	<i>TPC^a</i>	<i>LP^b</i>	<i>TYN^b</i>	<i>ELT^b</i>
<i>(units)</i>	<i>GAE/g</i>	<i>mg/mL</i>	<i>mg/mL</i>	<i>mg/mL</i>
EP	2.50 ± 0.13	1.60 ± 0.19	>1000	ND
OP	1.05 ± 0.05	ND	ND	ND
Orlistat		3.26 ± 0.28	-	-
Kojic acid		-	0.01 ± 0.00	-
EGCG		-		0.20 ± 0.01

^aTotal phenolic content (TPC) was mg of gallic acid equivalent (GAE) per g; ^benzyme inhibitory activities were demonstrated as 50% of inhibitory concentration, IC₅₀ (mg/mL). EP = pepper extracted in ethanol; OP = pepper extracted in rice bran oil; EGCG = epigallocatechin gallate; LP = anti-lipase activity; TYN = anti-tyrosinase activity; ELT = anti-elastase activity; ND = Not determine

RESEARCH ARTICLE

In-vitro Antioxidant and Anti-Inflammation Activities of Ethanol Extract from “Bang Chang” Thai Cultivar Chili Pepper (*Capsicum annuum* Var. *acuminatum*)

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Received: 10th February, 2023; Revised: 22th June, 2023; Accepted: 21th August, 2023; Available Online: 25th September, 2023

ABSTRACT

Chili peppers (*Capsicum* spp.) are really important crops in several Asian countries. In Thailand, chili pepper cultivars are also a wide range of flavors, colors, shapes, and spiciness levels. The cultural importance in Thai cuisine. The “Bang Chang chili pepper” (*Capsicum annuum* var. *acuminatum*), a Thai cultivar of capsicum, had first cultivated in Bang Chang subdistrict, Samut Songkhram, Thailand. This study aimed to determine capsaicin, phenolic compounds and flavonoids and screen ethanol extract’s biological activities. The extract’s average capsaicin and total phenolic content (TPC) was 10.4 ± 0.3 (g/100 mL) and 2.50 ± 0.13 mg GAE/g, while it could not determine flavonoids. The low amount of capsaicin in extract was defined this cultivars as non-pungent capsicum (0-700 Scoville Heat Units, SHU). This extract was strongly scavenged NO and DPPH radicals ($IC_{50} = 0.09 \pm 0.02$ and 14.88 ± 1.59 mg/mL). There was also exerted *in-vitro* anti-inflammation activity by suppression of albumin breakdown ($IC_{50} = 0.51 \pm 0.05$ mg/mL), which, can comparable to control, diclofenac diethyl ammonium ($IC_{50} = 0.45 \pm 0.01$ mg/mL). Therefore, lipid peroxidation was weakly inhibited ($IC_{50} > 1,000$ mg/mL) and unable to trap metals compared to vitamin E and EDTA. According to our finding, this extract was exerted biological properties like antioxidant and anti-inflammation, as well as being non-pungent, it can be used externally for medicinal purposes like as a muscle relaxant and massage oil to reduce subcutaneous fat. This extract can be used as a condiment in Asian recipes and other healthful dishes.

Keywords: *Capsicum annuum* var. *acuminatum*, Chili pepper, Antioxidant, Anti-inflammation.

International Journal of Pharmaceutical Quality Assurance (2023); DOI: 10.25258/ijpqa.14.3.38

How to cite this article: Thongkao K, Sudjaroen Y. *In-vitro* Antioxidant and Anti-Inflammation Activities of Ethanol Extract from “Bang Chang” Thai Cultivar Chili Pepper (*Capsicum annuum* Var. *acuminatum*). International Journal of Pharmaceutical Quality Assurance. 2023;14(3):691-694.

Source of support: Nil.

Conflict of interest: None

Table 1: Bioactive compounds contained in capsicum extract*

<i>Compound (units)</i>	<i>Capsaicin ($\mu\text{g}/100\text{ g}$)</i>	<i>TPC (mg GAE/g)</i>	<i>TFC (mg QE/g)</i>
Ethanol extract	10.4 \pm 0.3	2.50 \pm 0.13	ND

*All parameters were calculated from triplicated measurements;

GAE = gallic acid equivalent; QE = quercetin equivalent; ND = not determined

Table 2: Antioxidant and anti-inflammation activities of chili pepper extract

<i>Assay</i>	<i>DPPH (mg/mL)</i>	<i>NO (mg/mL)</i>	<i>LPI (mg/mL)</i>	<i>MC (mg/mL)</i>	<i>ALB (mg/mL)</i>
Ethanol extract	14.88 \pm 1.59	0.09 \pm 0.02	>1,000	ND	1.09 \pm 0.04
Vitamin C	0.04 \pm 0.01	0.02 \pm 0.00	-	-	-
Vitamin E			0.04 \pm 0.00	-	
EDTA				0.04 \pm 0.00	
Diclofenac diethyl ammonium	-	-			0.42 \pm 0.0

^aIC₅₀ = 50% of inhibitory concentration calculated from triplicated measurements or more; DPPH = 2,2-diphenyl-1-picrylhydrazyl radical scavenging activity; NO = nitric oxide scavenging activity; LPI = inhibition of lipid peroxidation; MC = metal chelating activity ALB = anti-inflammation by albumin degradation inhibition; ND = Not determine

RESEARCH ARTICLE

Antimicrobial Activity and Cytotoxicity of “Bang Chang” Thai Cultivar Chili Pepper (*Capsicum annuum* Var. *acuminatum*)Kanittada Thongkao¹, Pimporn Thongmuang², Yuttana Sudjaroen^{1*}¹Department of Applied Science, Faculty of Science and Technology, Suan Sunandha Rajabhat University, Bangkok, Thailand²Department of Aesthetic Health Science, College of Allied Health Sciences, Suan Sunandha Rajabhat University, Samut Songkhram, ThailandReceived: 12th April, 2023; Revised: 08th June, 2023; Accepted: 18th August, 2023; Available Online: 25th September, 2023

ABSTRACT

Capsaicin is found naturally in the Solanaceae family of plants and linked to numerous health advantage. Capsaicin is also responsible for the antimicrobial properties of chili pepper. Thai *Capsicum* cultivar “Bang Chang chili pepper” (*Capsicum annuum* var. *acuminatum*), initially cultivated in Bang Chang subdistrict, Samut Songkhram, Thailand. This study aims to determine bioactive substances such as capsaicin and phenolic content, as well as antimicrobial activity against pathogenic bacteria, *Staphylococcus aureus*, *S. epidermidis*, *Escherichia coli* and *Cutibacterium acnes* and yeast, *Candida albicans*, and cytotoxicity with human skin fibroblast cells. The TPC and capsaicin in the ethanol extract were 2.50 ± 0.13 mg GAE/g and 0.0104 ± 0.0 mg/100 mL, while in the oil extract were 0.0020 ± 0.0 mg/100 mL and 1.05 ± 0.05 mg GAE/g. Antimicrobial of this chili pepper was found in only oil extract that was inhibited against to *C. albicans* (inhibition zone = 10.68 ± 0.49 mm). There was preferable when compared to fluconazole ((inhibition zone = 24.65 ± 0.25 mm). Both extracts (0.0001-1.0 mg/mL) had no effect on human fibroblast cells, implying that they are non-toxic. The finding may imply that non-pungent capsicum strains cannot inhibit bacterial growth due to low amount of phenolics and capsaicin contained. Capsicum variety and temperature of extraction were also affected on their property. As a result, oil extract was favored for *C. albicans* suppression. This pepper extract can be used as an antifungal agent, and a pharmaceutical formulation must be developed.

Keywords: *Capsicum annuum* var. *acuminatum*, Chili pepper, Antimicrobial, Cytotoxicity.

International Journal of Pharmaceutical Quality Assurance (2023); DOI: 10.25258/ijpqa.14.3.24

How to cite this article: Thongkao K, Thongmuang P, Sudjaroen Y. Antimicrobial Activity and Cytotoxicity of “Bang Chang” Thai Cultivar Chili Pepper (*Capsicum annuum* Var. *acuminatum*). International Journal of Pharmaceutical Quality Assurance. 2023;14(3):601-604.

Source of support: Nil.

Conflict of interest: None

Table 1: Total phenolic content, capsaicin content and spiciness of capsicum extracts

Sample	TPC ^a	Capsaicin	Pungency ^b
(units)	GAE/g	mg/100 g	SHU
Ethanol extract	2.50 ± 0.13	0.0104 ± 0.0	0-700
Oil extract ^c	1.05 ± 0.05	0.0020 ± 0.0	0-700

^a Total phenolic content (TPC) was mg of gallic acid equivalent (GAE) per g; ^b pungency (spiciness) of chili peppers and other substances, recorded in Scoville heat units (SHU); ^c Chili pepper were extracted with rice bran oil

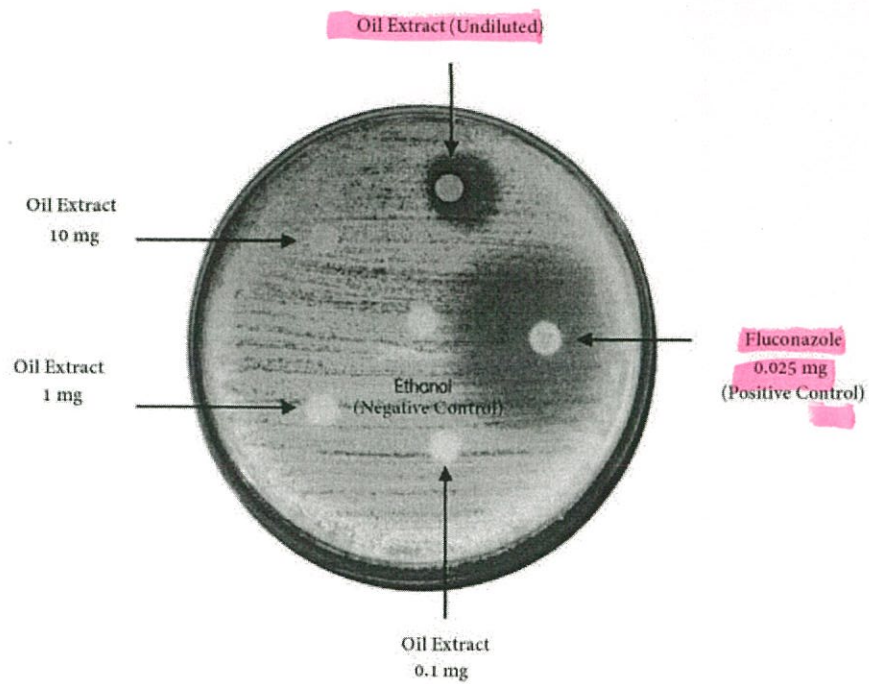


Figure 1: Inhibition zone of undiluted oil extract (100 mg) compared to fluconazole (0.025 mg)