Phytochemical Characterization of Cucumber (*Cucumis sativus* L.) Seeds as Candidate of Water Additive for Organic Broiler Chickens

Jet S. Mandey, Fenny R. Wolayan, Cherly J. Pontoh, and Bonie F. J. Sondakh
Animal Husbandry Faculty, Sam Ratulangi University, Manado, Indonesia
Email: jetsm_fapet@yahoo.co.id, feny_wolayan@unsrat.ac.id, cherlypontoh61@gmail.com, bfjsondakh@yahoo.com

***Abstract*—The research was conducted to evaluate the phytochemical characterization of cucumber (*Cucumis sativus* L.) as candidate of natural water additive for organic broiler chickens. Research was done by laboratory analysis to phytochemicals, proximate on chemical compounds, β-carotene and antioxidant potency of cucumber seeds. Data were analysed by descriptive method. Results showed that phytochemical screening by color visualization showed the presence of flavonoid, tannin, saponin and steroid. And, the quantitave analysis by spectrophotometry found the flavonoid total 0.36% (w/w), phenol total 0.40% (w/w), and analysis by titrimetry found tannin 2.82%. Proximate analysis on cucumber seeds were dry matter 90.53%, crude protein 26.68%, crude fat 14.14%, crude fiber 32.27%, Ca 3.024%, P 0.807% and gross energy 4817.72 Kkal. β-carotene compound analysed by TLC Scanner was 2.82% and antioxidant IC 50% analyzed by DPPH/Spectrophotometry was 6555.55 ppm. It can be concluded that cucumber seeds can be used as an alternative water additive because of nutrients and antioxidant bioactive potency.**

***Index Terms*—bioactives, cucumber, feed additive, nutrients, water additive**

I. Introduction

Plants are as the principal source of nutrients for animals, and sometimes as an unwelcome source of anti-nutritional factors that interfere with an animal's ability to maximize utilization of ingested nutrients. The present review considers the background of interest in the use of plants and their extracts are as alternative performance enhancers, and the non-nutrient bioactive compounds of plants [1].

Phytochemicals are primary and secondary compounds. Chlorophyll, proteins and common sugars are included in primary constituents and secondary compounds have terpenoid, alkaloids and phenolic compounds [2]. According to Mallikharjuna, *et al*. [3] phytochemicals are bioactive non-nutrient plant compounds that have protective or disease preventive property. They confer plants with odour (terpenoids), pigmentation (tannins and quinines), and flavour (capsacin). These bioactive components are said to be responsible for the antimicrobial effects of plant extracts *in vitro*. They are grouped as flavonoids, alkaloids, glycosides, saponins, tannins, terpenoids, carbohydrates, and sterols. Tang, *et al*., [4] have isolated the antimicrobial sphingolipids from cucumber stem.

Cucumber (*Cucumis sativus* L.), belongs to family Cucurbitaceae, is most widely cultivated vegetable crop all over the world [5]. Cucumber is the fourth most important vegetable crop after tomato, cabbage, and onion [6]. Although its calorie and nutritional value is very low, it is a primary source of vitamins and minerals in the human diet [7]. Due to high content of potassium (50-80 mg/100g), cucumber can highly be useful for both high and low blood pressures [8].

Cucumber is a widely cultivated plant of gourd family which is eaten in the unripe, green form. Its fruit extract has shown free radical scavenging and analgesic activities in mice [9], carminative and antacid property [10]. Studies of Gill, *et al*. [11] have shown the antioxidant and antiulcer effect of *C. sativus* in rats. The vegetables contain several phytochemicals possessing antioxidant activity, and the major groups of phytochemicals include vitamin A, C, E and K, carotenoid, terpenoid, flavonoids, polyphenols, saponins, enzymes and minerals.

Recent researchs have identified a vast majority of antioxidants from vegetables and fruits, like vitamin A, C, E, β-carotene, glutathione precursors like selenium, vitamin B2 (Riboflavin), B3 (Niacin), B6 (Pyridoxin), B9 (Folic acid), B12 (Cyanocobalamine). Bioflavonoids are very rich in all vegetables with vivid colors stand as prophylactic [12]. Tang, *et al*. [4] have isolated the antimicrobial sphingolipids from cucumber stem. Abiodun and Adeleke [13] reported that the seeds of the plant served as good source of protein, fat, minerals and calcium. Seeds are cooling, tonic, diuretic and anthelmintic [14]. There is a lack information about the research of cucumber seeds, so, this research was conducted to evaluate the phytochemical characterization of cucumber seeds as candidate of natural water additive for organic broiler chickens.

II. Materials and Methods

A. Sample Collection

The sample of *Cucumis sativus* seeds were washed, dried and stored in cold dark conditions. Powdered

Manuscript received June 30, 2018; revised November 22, 2018.

doi: 10.18178/joaat.6.1.61-64

seeds were defatted with hexane. Then extraction was carried out with solvents of increasing polarity such as methanol by maceration process for 16 h at room temperature.

Determination of Proximate Chemical Composition: Determination of moisture, total ash, crude protein, crude fiber, crude fat, were determined by standard method [15].

B. Phytochemical Screening

The preliminary phytochemical screening of the extracts was carried out to know the different constituents present as per the standard procedures. The extracts were tested for alkaloids, sterols, triterpenes, saponins, flavonoids, quinon and tannins [16], [17].

C. In-vitro Antioxidant Activity

DPPH (2,2-Diphenyl 1-picryl hydrazyl) assay method: The DPPH free radical is reduced to a corresponding hydrazine when it reacts with hydrogen donors. The DPPH radical is purple in colour and upon reaction with hydrogen donor changes to yellow colour. It is a decoloration assay, which is evaluated by the addition of the antioxidant to a DPPH solution in methanol and the decrease in absorbance was measured at 490nm.

Reagents: 2,2-Diphenyl 1-picryl hydrazyl solution (DPPH, 100μM): 22mg of DPPH was accurately weighed and dissolved in 100 ml of methanol. From this stock solution, 18 ml was taken and diluted to 100 ml using methanol to obtain 100 μM DPPH solution [18].

III. Results and Discussion

A. Phytochemical Screening and Flavonoid Estimation

In this study, the qualitative phytochemical analysis revealed the presence of bioactive compounds of cucumber seed (Table I). Results showed that phytochemical screening by color visualization showed the presence of flavonoid, tannin, saponin and steroid. The quantitative analysis spectrophotometry found flavonoid total 0.36% (w/w), phenol total 0.40% (w/w), and, the by titrimetry found tannin 2.82%. Proximate analysis on cucumber seeds were dry matter 90.53%, crude protein 26.68%, crude fat 14.14%, crude fiber 32.27%, Ca 3.024%, P 0.807% and gross energy 4817.72 Kcal. The value of β-carotene compound analyzed by TLC Scanner was 2.82% and antioxidant IC 50% analyzed by DPPH/Spectrophotometry was 6555.55 ppm.

The cucumber seed contained flavonoid that can be considered to a cheap source of flavonoids. According to Saxena, *et al*. [19], flavonoids have been reported to exert multiple biological property including antimicrobial, antioxidant, cytotoxicity, anti-inflammatory, as well as antitumor activity. Flavonoids, mainly present as colouring pigments in plants also function as potent antioxidants at various levels [20], [21]. Phenolic compounds comprise a large group of organic substances and flavonoids are an important subgroup. This group constitutes the majority of dietary antioxidants [22].

The cucumber seeds in this research also have tannin, saponin and steroid. This research was in line with Njoku and Akumefula [23], who reported that tannins have been found in the extracts of *Cucumis sativa* (Cucumber). Tannins have astringent properties, hasten the healing of wounds and inflamed mucous membrane. Tannins are potential metal ion chelator, proton precipitating agents and biological antioxidant [24]. Phytosterols have been found in the extracts of cucumber, also was reported by Castro, *et al.* [25], who stated that phytosterols have a significant hypocholesterolemic effect. Saponins have the property of precipitating and coagulating red blood [26]. They exhibit foaming properties and cell membrane-permeabilizing properties. Their soapy character is due to their surfactant properties [27].

TABLE I. Phytochemical Sreening of Cucumber Seeds

Phytochemical		Content	Unit	Technique Analyzed
Flavonoid		positive	-	Color visualization
Alkaloid	Wagner	negative	-	
	Mayer	negative	-	
	Dragendorf	negative	-	
Tannin		positive	-	
Saponin		positive	-	
Quinon		negative	-	
Steroid		positive	-	
Triterpenoid		negative	-	
Total Flavonoid		0.36	% (w/w)	Spectrophotometry
Total Phenol		0.40	% (w/w)	Spectrophotometry
Tannin		0.01	%	Titrimetry
β-carotene		2.82	%	TLC Scanner
Antioxidant IC 50%		6555.55	ppm	DPPH/Spectrophotometry

Cucumber fruits have been evaluated for a wide spectrum of activity including diuretic, antihyperglycemic, antioxidant, amylolytic, anticancer and analgesic activities *in vitro* and *in vivo* models [28]-[30]. There were only several reports to the potency of cucumber seeds. Gill, *et al*. [11] reported that methanolic extract of cucumber seed have triterpenoid, saponin, phytosterol, tannin, that possessed significant antiulcer potential which could be due to its antioxidant activity. Vetriselvan, *et al*. [31] reported that the seeds of the plant *Cucumis sativus* has anti-inflammatory effect that support to the traditional use of this plant for the treatment of related diseases. The seed extracts were found effective on controlling the loss of body weight in diabetic rats and against tapeworms [32].

Safe alternative to endogenous antioxidants is natural antioxidants. Fruits, vegetables and their products are dietary sources of antioxidants for maintaining the cellular functions in best way. Due to excellent potential of these compounds against chronic diseases, different reports have shown the vital role of antioxidants of fruits and vegetables to maintain body function in normal mode.

Antioxidant compounds like phenolic acids, polyphenols and flavonoids scavenge free radicals such as peroxide, hydroperoxide or lipid peroxyl and thus inhibit the oxidative mechanisms that lead to degenerative diseases [22]. Gill and Bali [14] stated that

triterpenoid glycosides present in cucumber seeds maybe responsible for the antioxidant and antiulcer activity.

Among the various natural pigments, carotenoids comprise a large family of more than 700 structures [33]. Most carotenoids can be derived from a 40-carbon basal structure, which includes a polyene chain contains 3 to15 conjugated double bonds. The pattern of conjugated double bonds in the polyene backbone of carotenoids determines their light absorbing properties and influences the antioxidant activity of carotenoids [34], [35].

B. Nutritional Evaluation

Chemical composition of cucumber seed meal is shown in Table II. Result showed that investigations on nutritional evaluation of cucumber revealed that their seeds are rich in crude protein, crude fat, gross energy and mineral Ca, followed by crude fiber. Abulude, *et al*. [36] reported chemical composition of cucumber, such as, protein in mesocarp 1.68%, in epicarp 3.84% and in endocarp 0.22%. Fat in epicarp 0.56% and in endocarp 0.02%. in this research, these plants resulted as a good source of nutrients (proteins, fats, carbohydrates, fiber and minerals) and can be used as alternative feed additive/water additive in either of these nutrients for organic broiler chickens.

TABLE II. CHEMICAL COMPOSITION OF CUCUMBER SEED MEAL

Ingredients	Content
Dry matter (%)	90.53
Crude Protein (%)	26.68
Crude Fiber (%)	32.27
Crude Fat (%)	14.14
Ca (%)	3.024
P (%)	0.807
Gross Energy (Kcal)	4817.72

IV. CONCLUSION

The present study reveals that these cucumber seeds served as good source of protein, fat, minerals, calcium and secondary compound which can be used for additive. It can be concluded that cucumber seeds can be used as an alternative water additive because of nutrient and antioxidant bioactive potency.

ACKNOWLEDGEMENT

The authors wish to thank to the "Program Bantuan Seminar Luar Negeri, Ditjen Penguatan Riset dan Pengembangan, Kemenristekdikti" for their financial supported and encouragement.

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Jet Saartje Mandey was born in Manado, North Sulawesi, Indonesia in 1953. She posses the Master (1987) degree in Public Nutrition and Family Resources from Bogor Agricultural Institute and Doctor (2013) degree in Animal Nutrition from Brawijaya University. Professor Mandey's specialization area in Animal Nutrition. She joined the services of Animal Husbandry Faculty, Sam Ratulangi University as a lecturer since 1980. Her current research interests include: poultry nutrition with emphasis agro-industrial by product, and use of various feed and water additives (herbal and local spices).

Fenny Rinay Wolayan was born in Treman, North Sulawesi, Indonesia in 1962. She possesed the Master degree (1998) and Doctor degree (2012) degree in Feed Technology from Padjadjaran University. Dr. Fenny's specialization area in Feed Technology. She joined the services of Animal Husbandry Faculty, Sam Ratulangi University as a lecturer since 1990. Her current research interests include: feed technology with emphasis agro-industrial by product.

Cherly Joula Pontoh was born in Tomohon, North Sulawesi of Indonesia in 1961. She possessed the Master Degree (2006) in Agronomy from Sam Ratulangi University. She joined the services of Animal Husbandry Faculty, Sam Ratulangi University as a lecturer since 1987. Her current research interests include animal nutrition.

Bonie F. J. Sondakh was born in Manado, North Sulawesi of Indonesia in 1954. He possesed the Master Degree (1985) in Rural Sociology from Bogor Agricultural Institute. He joined the services of Animal Husbandry Faculty, Sam Ratulangi University as a lecturer since 1980. His current research interests include: woman's roles in rural livestock.