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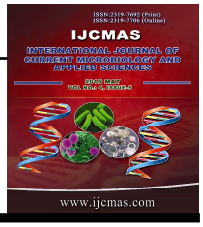

Original Research Article

Chemical Detection of some Active Compounds in Egg Plant (*Solanum melongena*) Callus as Compared with Fruit and Root Contents

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A B S T R A C T

This study was conducted in Biotechnology Center-Al-Nahrain University during the period from 3-5-2014 to 25-10-2014. Addition of NAA at the concentration of 1 mg/l, and 0.5 mg/l of BA led to the higher weight of callus (978 mg). The chemical detection showed the presence of alkaloids, flavonoids, tannins, steroids, and glycosides in callus extract as compared to its contains in root and fruit extracts. It would be necessary to carry out further study to confirm the true potential of *Solanum melongena*, so that it may be clinically applicable and commercially viable.

Keywords

Egg plant, Active compounds, Callus

Introduction

Solanum melongena var. esculentum is an economic flowering plant belonging to the family Solanaceae. The family contains 75 genera and over 2000 species (Biology of Brinjal, 2011). Members are mostly herbaceous plants, and the fruit is berry and seeds have large endosperm and are grown mainly for food and medicinal purposes (Igwe *et al.*, 2003). Various parts of the plant are useful in the treatment of inflammatory conditions, cardiac debility, neuralgias, ulcer of nose, cholera, bronchitis and asthma, Decoction of roots taken internally for asthma and as a general stimulant. Leaves are used for piles. The boiled root of the wild plant, mixed with sour milk and grain porridge, has been used for the treatment of syphilis. The juice of leaves used for throat and stomach troubles. Juice of the fruit, sometimes with pounded leaves, rubbed on suspected syphilitic eruptions of the hands. Fruit considered cooling, and bruised with vinegar. Chinese and Annamites used the roots for skin diseases (Mutalik *et al.*, 2003).

Phytochemical studies have yielded flavonoids, alkaloids, tannins and steroids. The medicinal properties of the plant are derived from its chemical constituents. The plant's antioxidant property is due to the flavonoids. The terpenes (steroids) make it useful for bronchitis. Analgesic property is because of the alkaloids. Besides, having many traditional uses, *Solanum melongena* is reported to exhibit many important

pharmacological actions. Fruits contain arginine, aspartic acid, histidine, 5-HT, delphinidine −3 bioside (nasunin), oxalic acid, solasodine, ascorbic acid, tryptophan, etc. Leaves contain chlorogenic, hydrocaffeic and protocatechuric acids (Rai and Pandey, 1997). Some of the alkaloids present are tropane, pyrrolidine, quinazolizidine, steroid alkaloids and glycoalkaloids (Evans, 2002). Two steroidal saponins - melongoside L and melongoside M, and three new saponins melongoside N, O and P, have been isolated from seeds (Kintia *et al.,* 1985). Catechol oxidase has been isolated and characterised from *Solanum melongena* (Sharma and Rashid, 1980).

A bioflavonoid glycoside named solanoflavone is present in the leaves and fruits of *Solanum melongena* (Shen *et al.,* 2005). The medicinal properties of the plant are derived from its chemical constituents. The plant's antioxidant property is due to the flavonoids. The terpenes (steroids) make it useful for bronchitis. Analgesic property is because of the alkaloids (Shrivastava *et al.,* 2012; Srivastava and Sanja, 2011). Roots considered antiasthmatic and stimulant. Leaves considered anodyne. Fruit considered cooling, digestive, phlegmatic.

Decoction of roots, dried stalk, and leaves is used for washing sores, exudative surfaces and used as astringent for hemorrhage from the bladder and other hemorrhagic fluxes (Mana *et al.,* 2004). *S. melongena is a* good source of calcium, phosphorus, iron, carbohydrates and fiber (Salerno *et al.,* 2014). The juice of leaves used for throat and stomach troubles. The peduncle is incinerated, used in intestinal hemorrhages, piles and toothache. Seeds used as stimulant but may cause dyspepsia and constipation (Kwon *et al.,* 2008). Juice of various plant parts and pulp of fruits of *S. melongena* and its wild allies used for various ailments: diabetes, otitis, toothaches, cholera, bronchitis, asthma, dysuria, among many others (Kwon *et al.,* 2007).

Materials and Methods

This study was conducted in Biotechnology Center laboratories /Al-Nahrain University during the period from 10-3-2014 to 15-10-2014.

Leaf and root sterilization

Solanum leaves were collected from private fields in Baghdad city. The initial plant material (leaves, roots and friuts) were washed in running tap water and surface sterilized using sodium hypochlorite (1%) for 15 min, and then rinsed three times in sterile distilled water.

Callus induction

Surface sterilized leaves were cut aseptically at the ends, and then placed on MS medium (Murashige and Skoog, 1962), in the Petri-dishes (100 x 15 mm). The medium was adjusted to pH 5.8 before solidified by agar (0.8%), then sterilized by autoclaving at 121◦C for 20 min. The basal medium consisted of salts and vitamins. For callus induction and maintenance the basal medium was supplemented with Benzyl adenine (BA) 0.5 mg/l and Naphthalene Acetic Acid (NAA) 1 mg/l. Cultures were incubated in growth chamber at 23-27 ◦C under slandered cool white fluorescent tube at 16 hour photoperiod (Zenk *et al.,* 1977).

Preparation of extracts

The plant callus and leaves were dried in an oven at 40 ◦C for 24 hour, and then powdered with mortar and pestle. The ethanol extract were prepared by maceration of plant material with ethanol (1:5 v/v) for 3 days at room temperature, then the extracts

were filtered with fine mesh and dried under vaccume pressure at 50 ◦C to yield a dense residue. The samples then transferred to glass vials and stored overnight before use (Akueshi *et al.,* 2002).

Chemical detection of active compounds

Detection of tannins

The extract of *B. variegata*var. esculentum was boiled in a boiling water bath for 10 minutes, then filtered and the filtrate was treated with 5 drops of 1% lead acetate solution. The development of greenish-blue precipitate is an indicator for the presence of tannins (Harborne, 1984).

Detection of terpenes and steroids

One milliliter of ethanol extract was participated in a few drops of chloroform, then 1 drop of acetate anhydride and 1 drop of concentrated sulfuric acid were added, brown precipitate appeared which representing the presence of terpene, and the appearance of dark blue color after 4-5 minutes would ensure the present of steroids (Harborne, 1984).

Detection of flavonoids

Ethanol extract was partitioned with petroleum ether using Buckner funnel; the aqueous layer was mixed with the ammonia solution. The appearance of dark color is an evidence for the presence of flavonoids (Harborne, 1984).

Detection of alkaloids

The extract (10 gm) was boiled with 50 ml of distilled water and 4% of hydrochloric acid was added, then the solution was filtered and cooled. 0.5 ml of the supernatant was tested with Mayer solution, appearance of white precipitate indicates the presence of alkaloids (Harborne, 1984).

Detection of saponins

Saponins were detected by two methods: The first method, aqueous extract of *B. variegata* powder was shaken vigorously with distilled water in a test tube. The formation of foam standing for a time indicates a positive result. The second method, five milliliters of aqueous extract of the plant was added to 1-3 drops of 3% ferric chloride solution, a white precipitate was developed which indicates a positive result (Harborne, 1984).

Results and Discussion

Callus induction and maintenance

The results in table 1 showed that the addition of NAA at the concentration of 1 mg/l, and 0.5 mg/l of BA led to obtain callus weight 576 mg at the combination of 1 mg/l and no BA added while it was 764 mg at the combination of 1 mg/l and 0.2 mg/l of NAA and BA respectively. The optimal weight of callus was 978 mg at the combination of 1 mg/l of NAA and 0.5 mg/l of BA. Literatures were indicated these results (Abdellatef and Khalallah, 2008).

Active compounds

Table 2, 3 & 4 indicated the presence of some active compounds in the callus, leaf and fruit extracts of *S. melongena*.

Table 2 showed the presence of alkaloids, terpens, steroids, glycosides, tannins, and flavonoids in callus extract, while it was found the presence of flavonoids, steroids, and alkaloids in the root as compared to the fruit extract which contains alkaloids, flavonoids, tannins, steroids, and glycosides.

The combination of NAA and BA resulted in friable callus with high weight. Other researcher used 2,4-D to induce callus growth and maintenance (Dodds and Robert, 1995). The chemical detection of *S. melongena* extracts showed that it was rich in flavonoids with antioxidant activities. A study proposed a more physiologically relevant explanation in the phenolic-linked antioxidant activity and alpha-glucosidase inhibitory potential of eggplant which can reduce hyperglycemia-induced pathogenesis. The phenolic antioxidant-enriched dietary strategy also has a potential to reduce hyperglycemia-induced pathogenesis linked to cellular oxidation stress (21). Another study showed phenolic-rich extracts from eggplant with moderate free radical scavenging-linked antioxidant activity had high alpha-glucosidase inhibitory activity and moderate high angiotensin. A study confirmed the presence of polyphenols in various parts of the eggplant (Kwon *et al.*, 2008; Loredana Salerno *et al.*, 2014). Study yielded five steroidal compounds; three steroidal alkaloids: solasodine, solamargine and solasonine together with two steroidal glycosides: β-sitosterol-3-O- β-D-glucoside and poriferasterol-3-O- β-D-glucoside. All the Pharmacological studies reported the presence of some important active compounds, so it would be necessary to carry out further study to confirm the true potential of *Solanum melongena*, so that it may be clinically applicable and commercially viable.

Table.1 Percentage % of callus weight obtained from leaf explant by adding 1 mg/l of NAA and 0.5 mg/l of BA

NAA/BA	NAA (mg/l)		
	Callus weight (mg)		
BA (mg/l)	**0**	**0.5**	**1.0**
0	**_**	**322**	**576**
0.2	**100**	**388**	**764**
0.5	**112**	**348**	**978**

Table.2 Showed some active compounds in callus extract of *Solanum melongena*

Phytochemical compound	Ethanol extract of callus
Flavonoids	+
Tannins	+
Glycosides	+
Steroids	+
Alkaloids	+

Table.3 Showed some active compounds in root extract of *Solanum melongena*

Phytochemical compound	Ethanol extract of root
Flavonoids	+
Steroids	+
Alkaloids	+

Table.4 Showed some active compounds from fruit extract of *Solanum melongena*

Phytochemical compound	Ethanol extract of fruit
Flavonoids	+
Tannins	+
Glycosides	+
Steroids	+
Alkaloids	+

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