



Anxiolytic effects of cucumber

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Abstract

Cucumber (*cucumis sativus* L.) is a member of the cucurbitaceae family like melon, squash and pumpkins. It is a popular vegetable is very high in water content and very low in calories. It has potentially antidiabetic, lipid lowering and antioxidant. Cucumber plays important role in anxiety. Cucumber (*cucumis sativus* L.) shows anxiolytic effects. Cucumber has a cleansing action within the body by removing accumulated pockets of old waste materials and chemical toxins. Fresh fruit juice is used for nourishing the skin. It gives a soothing effect against skin irritations and reducing swelling. Cucumber contains multiple B vitamins including vitamin B1, vitamin B5, and vitamin B7. These vitamins help to deal with feelings of anxiety and also reduce some of the damaging effects if stress. The vitamins B1, B5 and B7 contained in cucumber are effective in helping the nervous system to relax, relieving anxiety and stress. Cucumber also has the power to relax and alleviate the sunburns pain. The fruit is refrigerant, haemostatic, tonic and useful in hyperdipsia, thermoplegia etc. The seeds also have a cooling effect on the body and they are used to prevent constipation.

Keywords: Cucumber, *Cucumis sativus* L., Anxiolytic effect, Cucurbitaceae.

Aim : To study of anxiolytic effects of cucumber.

Objectives :

- 1) To treat anxiety symptoms or disorders.
- 2) Cucumber are help to reduce extreme fear and worry.
- 3) Multiple B vitamins contained in cucumbers, which include vitamin B1, vitamin B5, and vitamin B7 are known to help ease anxiety and some effects of stress.
- 4) Cucumber helps in control stress level.

Introduction:

A plant which has active constituents of medicinal properties and is used to treat disease in different systems of medicine or traditionally used for the treatment of disease is considered as medicinal plant. Plants have been used as medicines from the ancient time. Medicinal plants are widely and successfully used on every continent. In Asia, the practice of herbal medicine is extremely well established and documented. As a result, most of the medicinal plants that have international recognition come from this region. Plants, plant parts and plant products served as the materials for the preparation of medicine and these medicinal plants and plant parts constitute an important natural wealth of a country. They play a significant role in primary health care service to rural people. Plants have the ability to synthesize a wide variety of chemical compounds that are used to perform important biological functions, and to defend against attack from predators such as insects, fungi and herbivorous mammals. Many of these phytochemicals have beneficial effects on long-long term health when consumed by humans, and can be used to effectively treat human diseases. At least 12,000 such compounds have been isolated so far; a number estimated to be less than 10% of the total. Chemical compounds in plants mediate their effects on the human body through processes identical to those already well understood for the chemical compounds in conventional drugs; thus herbal medicines do not differ greatly from conventional drugs in terms of how they work. Cucumber plays very significant role in to reduce anxiety. Multiple B vitamins present in cucumber , i.e. vitamin B1 , vitamin B5 , vitamin B7 are known to help ease anxiety and reduce some of the damaging effects of stress .



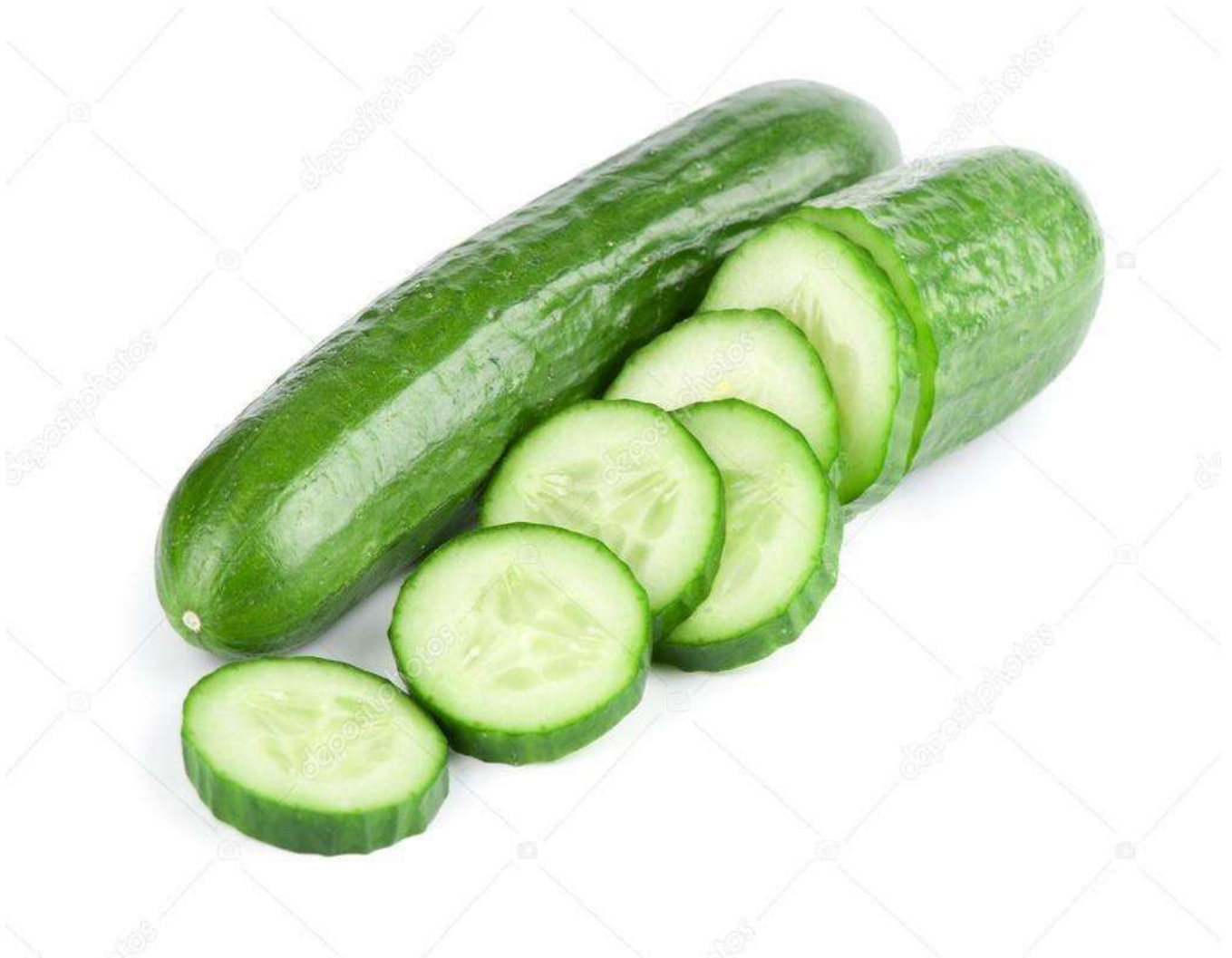


Figure 1.1 : Cucumber (*Cucumis sativus* L.)

Botanical Name: *Cucumis sativus* Linn.

Genus: *Cucumis*

Local Name: Hindi- Khir

Species: *C. sativus*.

Kingdome: Planate

Family: Cucurbitaceae

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Figure 1.2 : Cucumber Plant (Cucumis sativus L.)



Figure 1.3 : Flower of cucumber.

Anxiolytics effects:

Anxiolytics are a category of drugs used to prevent anxiety and treat anxiety related several anxiety disorders. These drugs tend to work rather quickly and can be habit forming. Because of this , they're usually only prescribed for short term use. They are not recommended for people with a history of substance misuse or addiction. Anxiolytics are also known as minor tranquilizer and prescribed to treat

and prevent symptoms of anxiety or for management of anxiety disorders. The term anxiety is no longer popular; the term 'anxiolytics' is frequently used because they diminish the feelings of anxiety. Anxiolytics may cause drowsiness or dizziness. Other side effects include lowered blood pressure, slowed breathing and problems with memory, long-term use can make side effect worse.

The multiple B vitamins contained in cucumbers, which include vitamin B1, vitamin B5, and vitamin B7 are known to help ease anxiety and some effects of stress. Some short – term side effects of anxiolytics can include:- slurred speech, low blood pressure, irregular breathing, memory loss, confusion, depression, dizziness.

Anxiety symptoms are appropriate responses to stressful events or situations and often improve spontaneously, particularly if they are mild and of recent onset. Anxiety disorders – panic disorder (PD), social-anxiety disorder (SAD), generalised anxiety disorder (GAD), post-traumatic stress disorder (PTSD), obsessive-compulsive disorder (OCD) and specific disorder – are however, by nature, disabling, chronic or recurring conditions that require long-term treatment . Full symptomatic remission is uncommon and their individual, societal and economic impact is substantial.¹Anxiety disorders affect anywhere between 8% to 18%of the general population in any given year, with a lifetime prevalence exceeding 28%.^{2,3} In South Africa, this figure, which excludes OCD and specific phobia, is estimated at 15.8%.⁴ Less than 30% of individuals who suffer from anxiety disorders, however, actively seek treatment.

Cultivation and collection:

Introduction :

Cucumber (*Cucumis sativus* L.) is an important vegetable crop from Cucurbitaceae family and having a chromosome number $2n = 14$. Cucumber is native of south Asia, specifically warm and humid climate of the Himalaya in North West India and probably northern Africa. It gives best response under high temperature, humidity and light intensity with sufficient supply of water and nutrients. In India cultivation of cucumber is noted at least 3000 years ago and during 100 B.C. in China. immature fruit of cucumber is used as salad and for making pickles, pahari rayata and brined on commercial scale (Bairagi 2013).

The fruit contains around 93-95 % water and it delivers sodium, magnesium vitamins, potassium, sulphur, silicon, fluorides etc. in a good amount. The mineral which present and make it alkaline represents 64.05 % and acid creating material is about 35.95 %. These are helpful to make it maintaining the human blood alkalinity.

Cucumber contains carbohydrates 2.6 gm, protein 0.6 gm, calcium 18 mg, thiamin 0.02 mg, energy 12 cal, riboflavin 0.02 mg, Iron 0.2 mg, C vitamin 10 mg, and niacin 0.01 mg in each 100 g edible portion (Rashid 1999). Cucumber is a good source of calcium, potassium, magnesium and folate also. It also provides silica, which helps to give strength and connecting tissue and helps to relief from joint pain. Cucumber also

contains secoisolariciresinol, lignans, lariciresinol and pinoresinol, which are helpful to reduce risk of different kinds of cancer.

The cucumber production is 71.36 million tons in globally (FAOSTAT 2014) and countries like India, China, Turkey, Iran, Japan, Europe and United States it is cultivated commercially.



Figure 1.4 : Cultivation and collection of cucumber (*Cucumis sativus* L) in polyhouse.

2. Soil requirement:

A well-drained, good soil structure, fertile soil with high porosity is required for cucumber crop. Good soil structure stability and high porosity are important with frequent water supply. For making these conditions, application large amount of organic matter and compost is recommended. Sandy loam soils having 5.5 to 6.5 pH is suitable for production of cucumber. 2.1 Soil 80% cucumber roots insert, develop and spread in soil up to 20 cm from the surface; they have poor tolerance capacity like drought, flooding and low

temperature. Preparation soil should be done very carefully like other vegetables inclusive of loose soil to provide good aeration for cucumber. In polyhouse, both flat bed and raised bed can be made. Bed width should be of 60-100 cm, which depends up on space between rows, and depth should be 25-30 cm.

3. Temperature:

Atmospheric temperature has impact on growth of plant, flower initiation and growth of the fruit and quality of fruits. An optimum temperature of ≤ 25 °C is required for faster growth of cucumber. At germination, average temperature is needed between 25–35 °C with good soil moisture and it takes 2-3 days to germinate. If the temperature comes down between < 13 –15°C, then shoot dose not grow properly. Maximum tolerable temperature for cucumber is around 38–40°C. Under protected cultivation maintenance of such temperature can easily be done.

4. Planting:

In polyhouse mainly cucumber is cultivated by transplanting. However directly seeding in bed is implemented for early autumn or late summer planting, when the temperature is generally high for good germination of seeds. Cucumber cultivation is successfully possible, if transplantaion can be done properly. The root system of young seedlings may be damage and growth is restricted if soil temperature is low. On the other hand, overgrown or aged seedlings do not established in soil. Cucumber seedling should be placed deeply in soil and irrigated immediately for stand establishment. Irrigation water helps to plant to protect from fluctuation of temperature during day and night.

5. Trellising and pruning:

Wire technique and string require for trellising for cucumber. Grower adopts different kinds of method according to their preference and availability of materials. In polyhouse uniform sunlight throughout growing season is available. To get optimum yield, it is important to make optimum balance between fruit load and vegetative growth in growth cycle. Pruning of shoot, foliage, flower and even fruits is necessary because if there is more number of fruits then maximum are aborted, poor coloured and malformed. The situation also increases if proper sunlight is not there. In general for long fruit cultivars, one fruits per axial should be allowed to develop, but vigorous cultivars allow more than one when the plant is matured. It is very much important that remove the lateral branches, flower and tendrils for 7-8 leaf nodes. All the lateral branches should be removed and plants are to be trained to single stem. The bottom leaves are removed gradually as the new leaves are present in upper part of stem. Once plant gets support with wire then it is allowed to reach a growth up to 20 cm according to wire height.

6.Irrigation:

Irrigation management is essential for both yield and product quality. Cucumber has pretty high water requirement; irrigation frequency also requires high. It is very much important that water and aeration in root zone should be maintained to provide adequate supply of oxygen to root. Daily water requirement

depends on many factors like temperature, light intensity, relative humidity, plant density and phenological stage. In light sandy soil water drains off quickly; so application of water needs frequently to maintain the moisture in root zone. When mulching is applied significantly less irrigation is needed because it reduces evaporation. Drip irrigation is most suitable techniques for cucumber grown in polyhouse. The EC of irrigation water should be $< 1 \text{ dS m}^{-1}$ and pH slightly acidic.

7.Fertilizer:

The demand of nutrients for cucumber is higher at fruiting stage and it remains high during fruit production stage. Though cucumber requires high dose of nutrients, it is very much sensitive to application of excessed or sudden variation of nutrients, as well as significant fluctuation in concentration of nutrients in soil. To avoid such types of cases, it is recommended analyse the soil frequently and on the basis of soil test results; application of fertilizer is done in splits.

8.Harvesting and post – harvest :

Cucumber can harvest on good environment which start around 30-35 days after transplanting and depends on cultivars chosen, climate conditions and modern technology used. Harvesting of cucumber is mainly done at immature stage, when length has reached.

Utilization :

Traditional use: Cucumber are laxative, astringent, anthelmintic and antipyretic; useful in hepatitis, bronchitis, asthma, dyspepsia, piles, diarrhoea, coughs hoarseness of voice, eye diseases and scorpion-sting; used as a hair tonic. Decoction of the green fruit is used for cough. Pulp of the fruit is useful in dysenteric-diarrhoea, dropsy, piles and leprosy. Half ripe fruit is used as purgative. Kernel of the fruit is narcotic. Fruits are used in menstrual disorder in Khagrachari. Seed oil is used in rheumatism. Gum of the bark is demulcent and purgative. The triterpenoid present in the fruits possess significant antimicrobial activity. Kernel oil has purgative action and its prolonged use was well tolerated in mice.

Industrial use: Medicinal plants are the richest bio resource of drugs for traditional systems of medicine, modern medicines, nutraceuticals, food supplements, folk medicines, pharmaceutical intermediates and chemical entities for synthetic drugs. The first step in the value addition of medicinal bio resources is the production of herbal drug preparations, using a variety of methods from simple traditional technologies to advanced extraction techniques. The extract is further processed to be incorporated in any dosage form such as tablets and capsules. With the increasing demand for herbal medicinal products, nutraceuticals, and natural products foraceuticals, and natural products for health care all over the world, medicinal plant extract manufacturers and essential oil producers have started using the most appropriate extraction technologies in order to produce extracts and essential oils of defined quality with the least variations from batch to batch.

Antimicrobial activity: Three antimicrobial sphingolipids were separated by bioassay-guided isolation from the chloroform fraction of the crude methanol extract of cucumber (*Cucumis sativus*.) stems and identified as (2S,3S,4R,10E)-2-[(2'R)-2-hydroxytetra-cosanoylamino]-1,3,4-octadecanetriol-10-ene,1-O-β-D-glucopyranosyl(2S,3S,4R,10E)-2-[(2'R)-2-hydroxy-tetracosanoylamino]-1,3,4-octadecanetriol-10-ene (2) and soyacerebroside I (3) by their physicochemical properties and spectroscopic analysis.

They were evaluated to show antifungal and antibacterial activity on test microorganisms including four fungal and three bacterial species. Among them, compound 1, a relatively low polarity a glycone, exhibited stronger antimicrobial activity than its corresponding glycoside 2. The results indicated that sphingolipids could be the main antimicrobial compounds in the crude methanol extract of cucumber stems.

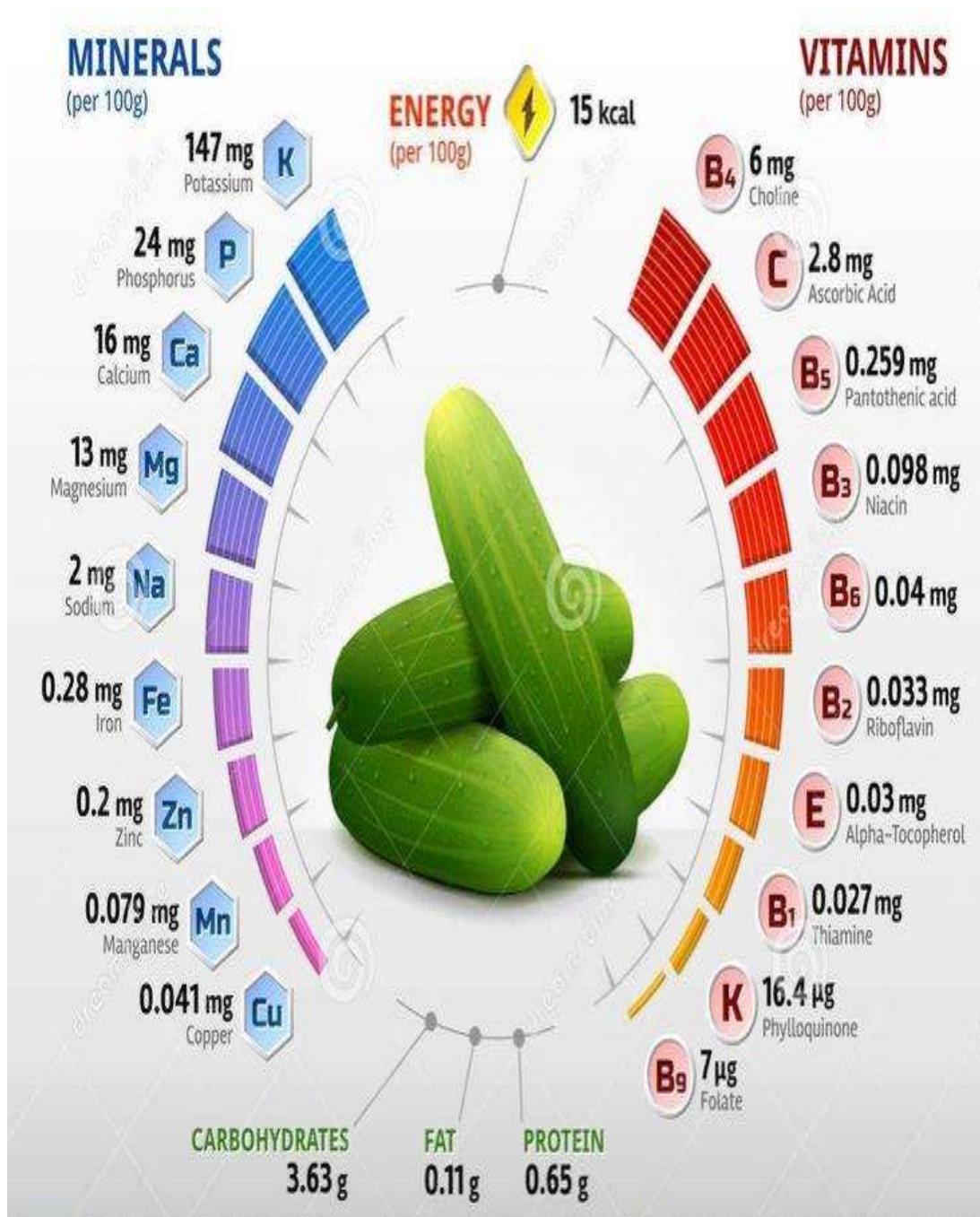
Antibacterial activity: The antimicrobial activity of CS against 4 human microbial pathogens. Antimicrobial assay was performed by Agar well diffusion method. Specific concentration of seed extract was showed highest zone of inhibition against *S. aureus*. These pathogens were highly sensitive to the methanol extract also except *E. coli* (enter pathogen) and *P. aeruginosa*. Finally they concluded that CS seeds possess potential broad spectrum antimicrobial activity.

Skin irritation/ Sensitization: The irritation and sensitization potential of two formulations containing 0.00055% *Cucumis Sativus* (Cucumber) Fruit Extract was evaluated in a modified occlusive human repeat insult patch test (HRIPT). A 21-day induction phase, 10-24 day non-treatment period, and 4-day challenge phase was used. Distilled water was the negative control and sodium laurel sulphate (SLS) was the positive control in both studies. In the first study, a moisturizer containing 0.00055% *Cucumis Sativus* (Cucumber) Fruit Extract was applied neat to 101 subjects. The standardized cumulative irritation score was 0 for both the test material and distilled water and was 2430 for 0.5% SLS. (The scoring scale was not defined.) The formulation containing 0.00055% *Cucumis Sativus* (Cucumber) Fruit Extract was not predicted to be a significant skin irritant, and it was not a sensitizer.

Wound healing activity: Patient alwere studied on pharmacological evaluation of wound healing potential of *Cucumis sativus*. He stated that aqueous extracts of *Cucumis sativus* have proper efficacy on wound healing. Herbal paste preparation showed significant ($P < 0.05$) improvement on maturation, wound contraction and epithelialisation.

Antacid and carminative activity: Swapnil Sharma et al was investigate with the aqueous extract fruit pulp of *C. sativa* significantly neutralized acid and showed resistance against change in pH and also illustrate good carminative potential. The extract of *C. sativa*, has shown to possess significant carminative and antacid property.

Figure 1.5 : Vitamins and minerals of cucumber:



Health beneficial effects of cucumber (*cucumis sativus* L.):

Cucumber is a healthy fruit which having lots of benefits. Cucumber regulates hydration and maintain adequate blood pressure and sugar, soothes skin, helped in digestion and reduces fat and help to weightloss. Cucumber contains a plenty of potassium, fiber, magnesium, manganese and vitamin A, C, K. Cucumber has several health beneficial activities such as antimicrobial properties, hydrating and detoxification, help in digestion and weight loss, preventing cancer and other frag-ile bone disease. In this book chapter we have discussed about the health beneficial activities of cucumber along with its different contents. Cucumber juice can acts against acidity and resist to change in pH and have good carminative and

antacid potential. Cucumber has also eye soother activities. Keeping cucumber slices on the eyes for about 10 minutes relaxes our eyes and reduces puffiness around the eyes. Cucumbers contains 96% water. Therefore, it helps to fill up the daily requirement of water by the body and keep body hydrated. In summers, people tend to dehydrate easily.

Consuming cucumber can make hydrate and it also acts as a coolant and give relief from the summer heat. Cucumber and mint can use to make detox water which effectively eliminates toxins from the body, improves hydration and thus results in innumerable health benefits. Cucumbers are a good source of potassium, magnesium and dietary fibre. These nutrients are known to lower blood pressure, thus reducing the risk of heart diseases. Research has also proved that regular consumption of cucumber juice was helpful in reducing blood pressure, in elderly people with hypertension. Cucumbers act as a coolant for our stomach. The soluble fibre in cucumbers helps in slowing our digestion. Also, the high content of water in cucumber makes our stools soft, prevents constipation and keeps our bowel movements regular. Cucumbers are known to reduce blood sugar levels, thus being helpful in the management and prevention of diabetes mellitus Cucumbers contain 96% of water and are low in calories.

Occupational allergy from cucumber:

Greenhouse workers are likely to be exposed to high levels of e.g. plant material and allergens in the enclosed conditions. Cultivation in green-houses has been identified as risk to occupational allergies caused by the vegetables, flowers, insects and mites living on the plants. This case series reports four cases of suspicion occupational rhinitis to cucumber together with suspicions of occupational contact. Patients were non-smoking employees allergies, all immigrants. After 1-3 years greenhouse work they began to nasal symptoms: sneezing and rhinorrhea at work. Despite of symptoms of rhinitis and or red, itchy swollen skin symptoms after work, some of them continued their work and symptoms increased to cough and shortness of breath. Skin prick test done with cucumber revealed 3-8mm wheals in all of them. Nasal challenge test done with cucumber fruit juice confirmed the occupational allergic rhinitis in three of them, one case was diagnosed on the grounds of sensitization and symptoms.

Biological properties of cucumber extracts:

Cucumis sativus L. (*C. sativus*) are usually served as appetizers or deserts. They are also associated with cooling, healing, soothing and emollient effects. Most importantly, they are found to exhibit a wide spectrum of activity including antioxidant and amylolytic. However, all the reported studies involved extracts from either exothermic condition (high temperature soxhlet extraction) or using volatile organic solvent (e.g. dichloromethane, ethanol, and methanol). Previous studies found that the methanolic fruit pulp and ethanolic leaves and stems of *C. sativus* extracts possessed slightly

different phytochemicals content. However, both extracts do contained similar phytochemicals e.g. alkaloid, saponin, glycoside and tannin, The ethanolic leaves and stem showed weak antifungal activities against *Aspergillus niger*, *Blastomyces dermatitidis*, *Candida albicans*, *Pityrosporum ovale*, *Trichophyton* spp., spp. and moderate extraction has been done fresh and at 37°C, similar to human physiological temperature. This study was initiated due to the fact that cucumbers are commonly eaten fresh. The present study describes the potential of fresh *C. sativus* extracts in phosphate buffered solution and aqueous extracted at 37°C as cytotoxic and antibacterial agents.

Extraction of cucumber (*Cucumis sativus* L):

Three unripe cucumbers (in the range of 220 g – 320 g each) were randomly selected from the local farm in Kuantan. They were thoroughly washed and scrubbed, then left to dry. The peel and pulp were separated with their masses recorded. The peel and pulp were separately blended with phosphate buffered saline solution in a ratio of 1:3 (1 g of either portion of peel or pulp in 3 mL of PBS). The solution was incubated in water bath at 37°C for 8 hours. The slurry was filtered using gauze cloth and then centrifuged at 6500 rpm for 15 minutes in 4°C to obtain the supernatants. Dry PBS extract powder was obtained after spray-dried at an inlet temperature of 155°C with 5% maltodextrin in accordance to previous method . Dry aqueous extract powder was obtained following the above mentioned method with the substitution of PBS with deionized water.

Phytochemical screening:

Phytochemical screening was done using a small portion of the dry extract of the aqueous and PBS extracts of both *C. sativus* pulp and peel to determine the presence of tannins, flavonoids, alkaloids, saponins and steroids following some modified methods.

Dragendroff's test (alkaloid):

Dry powder extracts were dissolved in 5 mL of 1% hydrochloric acid on steam bath with addition of a few drops of Dragendroff reagent. Positive result of alkaloid was observed with the presence of turbidity or yellow precipitation.

Steroid test:

Dry powder extracts were dissolved in 3 mL of chloroform and layered with concentrated sulfuric acid. Observation of the color reddish brown at the interface showed the presence of steroid.

Froth test (Saponin) powder extracts were dissolved in 2 mL distilled water and shook vigorously for few minutes. Formation of stable foam showed the presence of saponin.

Shinoda test (flavonoid):

Dry powder extracts were added with few pieces of magnesium ribbon and then dropwised with concentrated hydrochloric acid. Positive result of flavonoids was observed with the presence of the color pink scarlet.

Ferric (III) chloride (tannin):

Dry powder extracts were added with few drops of ferric (III) chloride solution. A change of color of blue-green to black showed the presence of tannins.

Antibacterial susceptibility assay: Six bacteria of gram positive [*Bacillus cereus* (ATCC 117788), *Staphylococcus aureus* (ATCC 29213) and *Staphylococcus epidermidis* (IMRS 384/1052)] and gram negative [*Escherichia coli* (ATCC 35218), *Pseudomonas aeruginosa* (ATCC 27853) and *Klebsiella pneumoniae* (IMR K 41/09A)] were obtained from the microbe stock culture maintained on nutrient agar media at Kulliyah of Science, IIUM. The antibacterial activity was determined in accordance to the disc diffusion method. The disc was impregnated with 100 mg of extract per disc and inoculated on a dish. The plates were incubated overnight (24 hours) at 37°C. Zones of inhibition formed were measured to obtain the mean diameter. Streptomycin (10 µg/disc) was used as positive control and sterilized blank discs as negative control. The assay was done in triplicates.

Cytotoxic assay:

Both PBS extracts were active against human non-small cell lung carcinoma cell line (H1299) and human breast adenocarcinoma cell line (MCF-7) compared to the inactive aqueous extracts (as shown in Table 1). It is interesting to note that the PBS extracts are more active towards the p53 deficient human cell line H1299 than the estrogen dependent MCF-7 cell lines. These two carcinoma cell lines, H1299 and MCF-7 existed in an opposite nature, one through signaling pathway and the other by hormonal influential, respectively. The PBS pulp extract was active against H1299 (IC₅₀ = 42.0 mg/mL) and against MCF-7 (IC₅₀ = 125.0 mg/mL) when compared to the PBS peel extract against H1299 (IC₅₀ = 52.0 mg/mL) and against MCF-7 (IC₅₀ = 290.0 mg/mL).

Conclusion:

The cucumber plant (*Cucumis sativus* L.) is a plant that plays very important role in anxiolytic effects. This plant is rich in chemical compounds that are scattered in every part of the compound. The multiple B vitamins contained in cucumbers, which include vitamin B1, vitamin B5 and vitamin B7 are known to help ease anxiety and some effects of stress. It is popular vegetable is very high in water content and very low in calories. It is a popular vegetable crop used in Indian traditional medicine since ancient times.

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