

A POTENTIALITY OF TOMATOES AND RED CHILIES AS NUTRACEUTICALS FOR THE TREATMENT OF CANCER

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Abstract : Cancer is one of the leading causes of death and globally the numbers of cases of cancer are increasing day by day. Several medicines are available in the market for the treatment of cancer but no effective and safer drug was reported till today. The prevalent therapies of cancer are not very fruitful and these are very costly for common beings. Here an attempt is being made through this review to aware our society for the importance of Red Chili (*Capsicum annum L.*, *synm-Capsicum frutescen L.*) and Tomato (*Lycopersicon esculentum Mill.*) for cancer prevention.

Key Words: *Cancer, Cancer Cells, Prevalent Therapies, Drug, Red Chili, Tomato.*

INTRODUCTION

Cancer and its causes

Cancer ⁽¹⁾ (synm- neoplasm) is a dreadful disease which is prevalent in our society. It is an abnormal growth of cells in body that can lead to death. Cancer cells usually destroy normal cells by invading on them. These cells are borned due to one of the three factors, viz. incorrect diet (either by taking unbalanced diet or fast food), genetic predisposition and via the environment. The environmental factors include smoking, chewing tobacco, using pan-masala, infectious disease as well as chemicals, radiation in our homes and working place along with trace levels of pollutants in food, drinking water and air. Other factors which may cause cancer, are not enough physical activity, exposure to ionizing radiation, carcinomas chemicals, certain metals etc. Cancer cells can initiate, spread, lodge and grow on various tissues and organs throughout body where the most common sites of cancer among men are lungs, prostate, colorectal, stomach, liver and among women in the breast, colorectal, lungs, cervix and stomach.

Recently, cancers are treated by radiotherapy, surgery, and chemotherapy. The major disadvantage of chemotherapy are the recurrence of cancer associated with drug resistance and severe side effects that can limit the use of anticancer drugs and thus put patients under strain and further damage their health. Therefore, there is a focus on using alternative treatment and therapies which are useful against cancer.

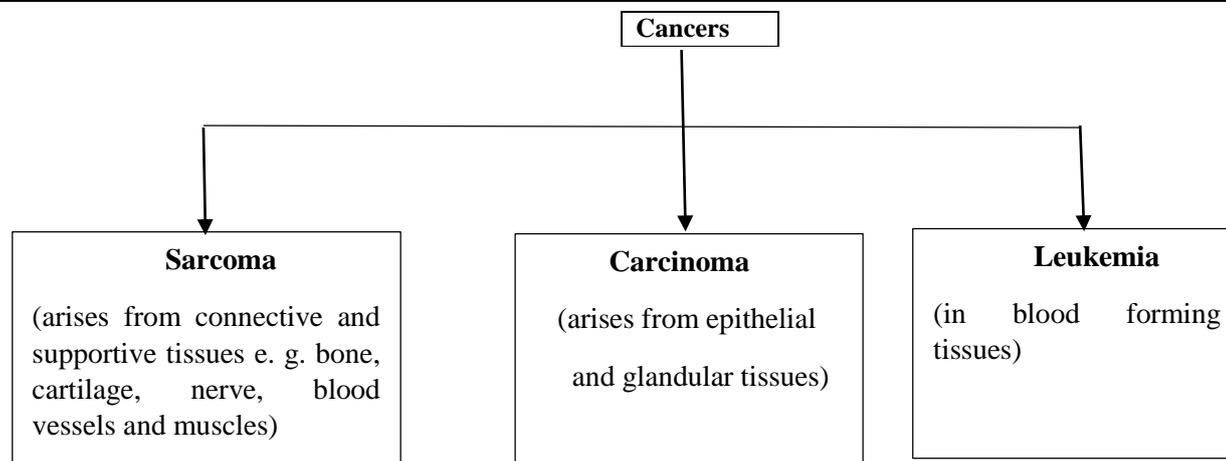
Classification of Cancer

Cancers may be classified as given below:-

(A) **Ayurvedic Theory of Cancer** : According to Charak and Sushruta Samhita ^(2,3), the equivalent of Cancer described as “*granthi*” and “*arbuda*” ⁽⁴⁾. “*Granthi*” and “*Arbuda*” can be inflammatory or devoid of inflammation, based on doshas involved ⁽⁵⁾. Three doshas “*Vata*, *Pitta* and *Kapha*” in the body are responsible for diseases and the balanced coordination in body, mind and consciousness is the Ayurvedic definition of health ⁽⁶⁾. Tridoshicarbudas are usually malignant because all three major body humors lose mutual coordination, resulting in a morbid condition ⁽⁷⁾. Neoplasm can be classified according to Ayurvedic Concept depends upon various clinical symptoms in relation to tridoshas.

1. **First group** - Diseases that can be named as clear malignancies including arbuda and granthi e. g. mamsarbuda (sarcomas) and raktarbuda (leukaemia), mukharbuda (oral cancer), and asadhya vrana (incurable or malignant ulcers).
2. **Second group** - Diseases that are not cancers but can be considered probable malignancies such as ulcers and growths. Examples of these are mamsaja oshtharoga (growth of lips), asadhya galganda (incurable thyroid tumor), tridoshaja gulmas, and asadhya udara roga (abdominal tumors like carcinomas of the stomach, liver or lymphomas).
3. **Third group** - Diseases in which there is a possibility of malignancy such as visarpa, asadhya kamala (incurable jaundice), asadhya pradara (untreatable sinusitis).

(B) **Allopathic Theory of Cancer**: Cancers are classified according to tissues and type of cells in which new growth occurs that are tabulated as given below –



Red chili and Tomatoes as nutraceuticals

The word “nutraceutical” combines nutrition and pharmaceutical to mean that certain medicinal herbal extracts can be used as food supplements and preventive drugs. Fruits, vegetables and spices are natural dietary agents^(8,9,10) which are taken by mankind as these are not only nutritive but are also sometimes indispensable for the maintenance of the health. These nutraceuticals prevent and / or treat diseases and physiological disorders. In the light of above facts, Red Chilies and Tomatoes are chosen to aware the society for maintenance sound health and for the curing cancer. The chemical compositions of Red chili^(11,12,13) and Tomatoes^(14,15) have summarized in following table no. I, II to show their nutritional values as well as anticancerous activity in human beings.

Table No.- I: **Nutrient value of Red Chili (*Capsicum annum L.*) per 100 g**

Serial No.	Nutrients	Nutrient value
1	Energy	40 Kcal
2	Carbohydrates	8.81 g
3	Protein	1.87 g
4	Total Fat	0.44 g
5	Cholesterol	0.0 mg
6	Dietary Fiber	1.5 g
Vitamins		
1	Folates	23 µg
2	Niacin	1.244 mg
3	Pantothenic Acid	0.201 mg
4	Pyridoxine	0.506 mg
5	Riboflavin	0.086 mg
6	Thiamine	0.72 mg
7	Vitamin A	952 IU
8	Vitamin C	143.7 mg
9	Vitamin E	0.69 mg
10	Vitamin K	14 µg
Electrolytes		
1	Sodium	9 mg
2	Potassium	322 mg
Minerals		
1	Calcium	14 mg
2	Copper	0.129 mg
3	Iron	1.03 mg
4	Magnesium	23 mg
5	Manganese	0.187 mg
6	Phosphorus	43 mg
7	selenium	0.5 µg

8	Zinc	0.26 mg
Phyto-nutrients		
1	β -Carotene	534 μ g
2	α -Carotene	36 μ g
3	Cryptoxanthin-B	40 μ g
4	Lutein-Zeaxanthin	709 μ g

Chemical structure of reported active principles of Red Chili as anti-cancerous agents-

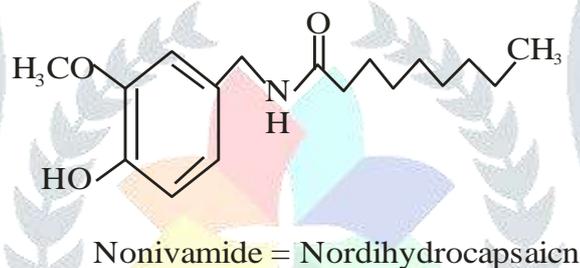
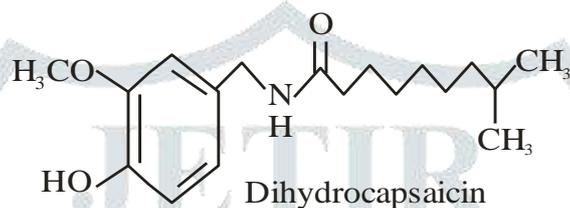
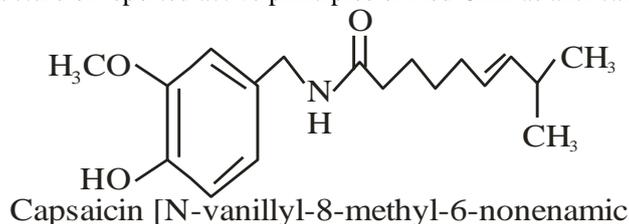
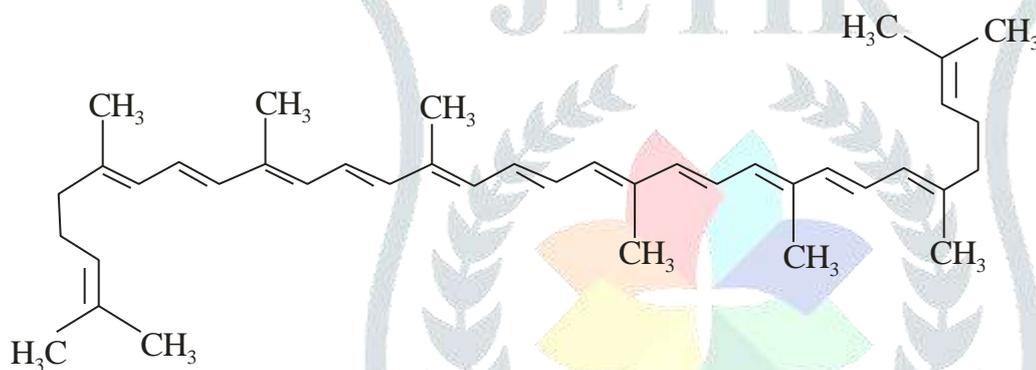


Table No.-II: Nutrient value of Tomato (*Lycopersicon esculentum* Mill.) per 100 g

Serial No.	Nutrients	Nutrient value
1	Protein	14.11 g
2	Fat	2.97 g
3	Carbohydrate (total)	55.76 g
4	Energy	258 Kcal
5	Alcohol	0.0 g
6	Moisture	14.56 g
7	Sugar (total)	37.59 g
8	Fibre	12.3 g
9	Saturated Fat	0.426 g
Vitamins		
1	Vitamin A	0 μ g
2	β -Carotene	524 μ g
3	Vitamin C	39.2 mg
4	Vitamin E	0.01 mg
5	Vitamin K	43 μ g
6	Vitamin B1	0.528 mg
7	Vitamin B2	0.489 mg
8	Vitamin B3	9.05 mg
9	Vitamin B5	2.087 mg

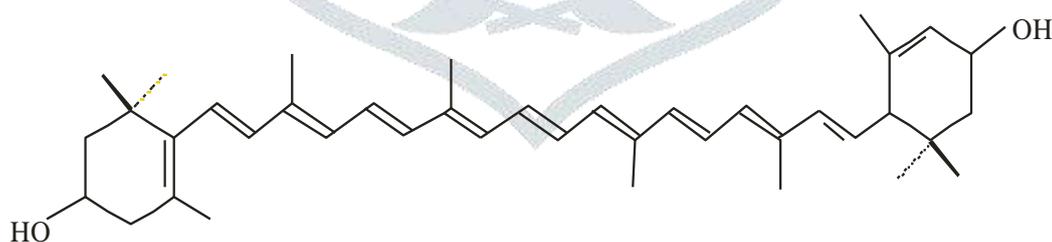
10	Vitamin B6	0.332 mg
11	Vitamin B11	68 µg
Minerals		
1	Calcium	110 mg
2	Magnesium	194 mg
3	Phosphorus	356 mg
4	Sodium	2095 mg
5	Potassium	3427 mg
Trace Elements		
1	Iron	9.09 mg
2	Zinc	1.99 mg
3	Copper	1.423 mg
4	Manganese	1.846 mg
5	Selenium	5.5 µg
Amino Acids		
1	Aspartic Acid	1.957 g
2	Glutamic Acid	5.202 g

Chemical structure of reported active principles of Tomatoes as anticancerous agents:-



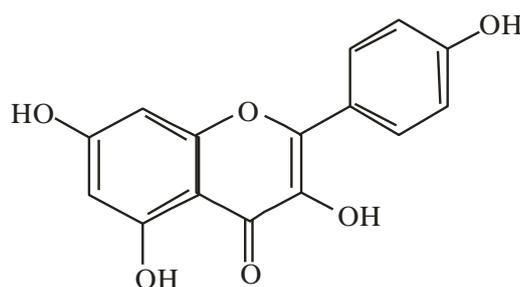
Lycopene (Molecular Formula $C_{40}H_{56}$)

Molecular Weight: 536.888 g/mol



Lutein (Molecular Formula $C_{40}H_{56}O_2$)

Molecular Weight : 568.85



Kaempferol (Molecular Formula $C_{15}H_{10}O_6$)

Molecular Weight: 286.23 g/mol

Each and every human being is taking Red Chilies and tomatoes in routine way along with food. Both of them play important role to maintain human health by providing nourishment for each and every parts of body and act as drug for prevention of cancer due

to presence of bio-active chemical constituents viz. Capsaicinoids, Lycopene, Lutein and Kaempferol in them. These bio-active principles are responsible for their anticancerous property.

These nutraceuticals (Red Chilies and Tomatoes) are believed to suppress the inflammatory processes that are responsible for transformation, hyperproliferation and initiation of carcinogenesis. The inhibitory action may finally prevent the final steps of carcinogenesis⁽¹⁶⁾ viz. angiogenesis and metastasis.

CONCLUSION

Nutraceuticals may proved very safe and effective for preventing the cancers among our society when these are taken along with standard synthetic drugs that are used for treatment of cancers today (Combination Therapy⁽¹⁷⁾ for Cancers is under trial). It is also believed that change in life style can also play a vital role to uproot this dreadful disease of Cancer from our society.

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