



COMPARATIVE ANALYSIS OF VITAMIN C CONTENT OF *COCCINIA INDICA* W.& A AND *TRICHOSANTHES DIOICA* ROXB. IN THE NINE AGRO CLIMATIC ZONES OF MAHARASHTRA.

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ABSTRACT The family Cucurbitaceae is of great economic significance in most of the tropical countries and is valued as world's second largest vegetable yielding family. This family includes vegetable fruits which primarily comprise species consumed as food worldwide. *Coccinia indica* W.& A and *Trichosanthes dioica* Roxb. are excellent fruit vegetables in nature having Vitamin C, iron content, minerals content, fibre content etc. as essential constituents required for good health of humans. Maharashtra state has been divided into 9 agro-climatic zones based on rainfall, soil type and the vegetation due to its large size and topography. It was thought necessary to find out whether the environmental conditions in the nine agro-climatic zones of Maharashtra have any effect on the Vitamin C value of these fruit vegetables. In the present investigation it was found that fruits of *Coccinia indica* collected during summer season showed maximum Vitamin C content compared to the fruits of *Trichosanthes dioica* also collected in the same season. It was also observed that in the nine agro-climatic zones of Maharashtra studied the fruits of *Coccinia indica* collected from Wardha of Central Vidarbha region showed maximum Vitamin C content, while fruits collected from Thane of North Konkan region showed minimum vitamin C content. In case of *Trichosanthes dioica*, fruits collected from Amravati from Central Maharashtra plateau region showed maximum vitamin C content, while fruits collected from Thane of North Konkan region showed minimum vitamin C content.

KEYWORDS : Nutraceuticals, Environmental factors, Vitamin C, Cucurbitaceae, Agroclimatic zones of Maharashtra.

1. INTRODUCTION

As the name suggests, nutraceuticals is a combination of the words 'nutrition' and pharmaceuticals, and they play a role in maintaining well being, enhancing health, modulating immunity and thereby preventing as well as treating specific diseases. They bridge the gap between food and medicine. Members belonging to Cucurbitaceae are mainly tropical and subtropical in distribution. (Chakravarty 1982). This Family consisting of about 120 genera and 825 species, (Schaefer *et. al.*, 2009), mainly consists of edible fruits with high nutrient value and immense medicinal importance. Most of the plants belonging to this family are frost sensitive and drought-tolerant (Whitaker & Bohn, 1950). The cucurbits are easily cultivated throughout India and are easily available to the common man. They contains important nutrients such as various minerals, vitamins, amino acids, flavanoids, Cucurbitacins etc. which are important to the nutraceutical companies (Chang *et. al.*2010). In Maharashtra, some of the common cultivated members of family Cucurbitaceae are *Trichosanthes*, *Momordica*, *Cucumis*, *Coccinia*, *Cucurbita*.

Out of these, 2 members i.e, *Trichosanthes dioica* Roxb. Commonly called Parrval and *Coccinia indica* W. & A. Commonly called Tendli, which are easily available and affordable to common man, were selected for the study and it was thought necessary to find out whether the environmental conditions in the nine agro-climatic zones of Maharashtra have any effect on the nutraceutical value of these fruit vegetables.

Ascorbic acid positively affects the synthesis of collagen, the most abundant extracellular protein. New strategies aimed to increase vitamin C in food plants would be of interest to improve human health. Interestingly, plants are not only living bioreactors for vitamin C production in optimal growing conditions, but also they can increase their vitamin C content as consequence of stress conditions. Vitamin C can be good drought resistant molecule synthesized by plants (Aziz *et. al.* 2018)

The aim of the project was

- 1) To analyze the nutraceutically important phyto-chemical constituent Vitamin C present in these plants collected from different regions of Maharashtra
- 2) To find out, maximum Vitamin C present in these regions
- 3) To find out whether the different environmental conditions in the different regions of Maharashtra have any effect on Vitamin C content of these in plants.

2. MATERIAL AND METHODS

A. Plant selection:

Plants selected: The 2 most easily available fruit vegetables affordable to common man was selected: *Trichosanthes dioica* Roxb. The

pointed gourd which is usually propagated through vine cuttings and root suckers and *Coccinia indica* W. & A. which is found in a climate that is warm and humid. It is found in almost all over India in the wild.

I. *Coccinia indica*

II. *Trichosanthes dioica*



B. Site Selection: Plants from the following regions were collected
MH-1 South Konkan Coastal: Vengurla, Ratnagiri (Chiplun and Rajapur).

MH-2 North Konkan Coastal Zone : Thane, Karjat, (Kolad) Raigad

MH-3 Western Ghat Zone : Lonawala, Igatpuri, Trimbak

MH-4 Sub-montane (Transition 1) Zone : Surgana, Peth, Patan

MH-5 White star Western Maharashtra Plain (Transaction 2) zone: Dhule, Nashik, Shirdi

MH-6 Scarcity Zone: East Dhule (Songir), East Nashik (Malegaon), Nevasa (A.nagar)

MH-7 Central Maharashtra Plateau (Assured rainfall) zone: Aurangabad, Amravati, Akola

MH-8 Central Vidarbha (Moderate rainfall) zone: Wardha, Yawatmal, Nagpur

MH-9 Eastern Vidarbha Zone: Gondia, Bhandara, Chandrapur.



C. Collection of sample

These plants were collected from the 9 agro-climatic zones of Maharashtra, in the summer months of April and May and they were analysed for Vitamin C content

D. Vitamin C Estimation Method: Determination of Vitamin C in the Fresh Fruit Vegetables were done by using the Dye-titration ie.

DCPIP (Dichlorophenolindophenol) method, ie. Tee et.al (1988) method.

Observation :

The fruits were collected in summer from various agro-climatic zones of Maharashtra and Vitamin C content was determined.

Vitamin C Content of *Coccinia indica* and *Trichosanthes dioica* in various in the nine agroclimatic zones of Maharashtra.

	Places of collection	Vit C of <i>Trichosanthes dioica</i> mg Vit C /100g fresh wt fruit	Vit C of <i>Coccinia indica</i> mg Vit C /100g fresh wt fruit
MH-1 South Konkan Coastal Zone	Vengurla	32.33 ±0.5773	34.33 ±0.5773
	Chiplun	32.66 ±1.1547	36.33 ±0.5773
	Rajapur	33.33 ±0.5773	36.33 ±1.5275
MH-2 North Konkan Coastal Zone	Thane	26.66 ±1.5275	29.66 ±1.5275
	Karjat	30.33 ±1.5275	33.66 ±1.1547
	Kolad	31.66 ±0.5773	36.66 ±0.5773
MH-3 Western Ghat Zone	Lonawala	27.33 ±1.5275	31.33 ±2.0816
	Igatpuri	30.33 ±0.5773	34.33 ±0.5773
	Trimbak	30.66 ±0.5773	35 ±1
MH-4 Sub-montane (Transition 1) Zone	Surgana	31 ±1.7320	35.33 ±0.5773
	Peth	32.33 ±0.5773	35.66 ±1.5275
	Patan	28.66 ±0.5773	32.33 ±1.1547
MH-5 Western Maharashtra Plain (Transaction 2) zone	Dhule	32.33 ±1.5275	35 ±2
	Nashik	32.33 ±2.0816	34 ±1.7320
	Shirdi	31 ±1.7320	36.66 ±1.1547
MH-6 Scarcity Zone	Songir	34.33 ±2.5166	35.66 ±2.0816
	Malegaon	36.66 ±1.1547	38 ±2
	Nevasa	36 ±1	38.66 ±1.5275
MH-7 Central Maharashtra Plateau (Assured rainfall) zone	Aurangabad	36.66 ±0.5773	37 ±1
	Amravati	37.66 ±0.5773	38.66 ±1.1547
	Akola	36.66 ±0.5773	38.33 ±1.5275
MH-8 Central Vidarbha (Moderate rainfall) zone:	Wardha	37.33 ±0.5773	41.66 ±1.5275
	Yavatmal	35.33 ±1.5275	38.33 ±0.5773
	Nagpur	36.33 ±0.5773	36.66 ±0.5773
MH-9 Eastern Vidarbha Zone	Gondia	34 ±1	35.66 ±1.1547
	Bhandara	34.33 ±0.5773	36.33 ±0.5773
	Chandrapur	36 ±1	38.33 ±0.5773

Values given are mean ±SD

It was observed that *Coccinia indica* shows maximum Vitamin C (41.66mg) in the fruits collected from Wardha of Central Vidarbha region. While *Trichosanthes dioica*, fruits collected from Amravati from Central Maharashtra plateau region showed maximum vitamin C content (37.66mg).

It was also observed that fruits collected from Thane of North Konkan coastal zone, showed minimum Vitamin C content in case of both *Coccinia indica*. *Trichosanthes dioica* 29.66 mg and 26.66 mg respectively. It was found that fruits of *Coccinia indica* collected during summer season showed more vitamin C contains compare to fruits of *Trichosanthes dioica* collected in the same season.

Results and Discussion: In the present investigation it was observed that maximum vitamin C content was observed in the fruits of *Coccinia indica* collected from Wardha from central Vidarbha region and *Trichosanthes dioica* collected from Amravati from Central plateau region. Reports in literature on the ascorbic acid- sun light relationship for strawberries which are rather conflicting, although they have agreed that there is a relationship, sunny days are essential for obtaining the maximum amount of ascorbic acid in strawberries. It is therefore to be expected that great variations in ascorbic acid content will occur in strawberries grown in different seasons and in different geographical locations. (Robinson 1949)

Jethmalani et. al. 2014 have recorded higher Vit C content in *Adathoda vasica* plants collected from Nashik compared to plants collected from Jalgaon Aurangabad Thane and Mumbai. Plants are not only living bioreactors for vitamin C production in optimal growing conditions, but can also increase their vitamin C content as a consequence of stress

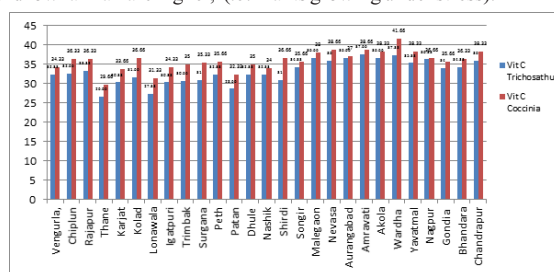
and hence plant can enhance vitamin C synthesis as part of defence responses (Lee et. al.2000). Role in photosynthesis and photoprotection, in defence against ozone and other oxidative stresses and speculations about its role in cell expansion and cell division are worked upon by several workers. Improved understanding of ascorbate in plants will lead to the possibility of increasing ascorbate concentration in plants by genetic manipulation. This will have benefits for human nutrition and possibly for tolerance of plants to photooxidative stresses (Smirnoff 1996)

MH-7 Central Maharashtra Plateau (Assured rainfall) zone and MH-8 Central Vidarbha (Moderate rainfall) zone are zones of high temperature and where they receive rainfall of about 800 to 1000 mm/annum. The summers are very hot and may reach upto 49°C. Hence to defend the summer Vit C is produced as a defence mechanism by plants. While in North Konkan region maximum temperature in summer is rarely above 41°C and the rainfall in this region is also very high in the range of 2000 to 3000mm/annum, which does not show much stress condition. Hence it could be the reason for lower amount of Vit C content in plants from regions with lower temperature and higher rainfall.

Conclusion:

Higher amount of Vitamin C was found to be present in the fruits of *Coccinia indica* Compared to *Trichosanthes dioica*. Fruits of *Coccinia indica* collected from Wardha from MH 8, are more important nutraceutically with reference to Vitamin C content as compared to the fruits of this plant growing in the other agroclimatic zones of Maharashtra, while fruits of *Trichosanthes dioica* collected from Amravati MH 7 are important nutraceutically with reference to Vitamin C content.

Vitamin C content in plants growing in regions with high temperature and low rainfall are higher, (ie. Plants growing under stress).



Vitamin C content mg/100 g fresh weight in the 9 Agro-climatic zones of Maharashtra

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