



COMPARATIVE ANALYSIS OF CUCURBITACIN C AND E IN *TRICHOSANTHES DIOICA* ROXB. COLLECTED FROM NINE AGRO CLIMATIC ZONES IN MAHARASHTRA, INDIA

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ABSTRACT Cucurbitaceae is an important family having a large number of fruit vegetables rich in the glycoside Cucurbitacin which is a very important nutraceutical compound. The Cucurbitacin content of these fruit vegetables are known to vary due to environmental conditions. It was thought necessary to estimate the Cucurbitacin content in *Trichosanthes dioica* Roxb from nine agro climatic zones of Maharashtra collected in the summer and winter season to ascertain the best region and best season for maximum cucurbitacin content.

KEYWORDS : Cucurbitacin C, Cucurbitacin E, Glycoside, Agro climatic zones of Maharashtra, Cucurbitaceae, *Trichosanthes dioica* Roxb.

INTRODUCTION:-

Cucurbitaceae is also known as the gourd family. The most common species are *Trichosanthes dioica* Roxb.. The vegetable fruit is commonly consumed in Maharashtra. They are cultivated in Maharashtra in all agro climatic zones and considered as most affordable and easily available fruit vegetable. It is also used as an anti diabetic food and is also considered as an anti-cancer medicine (Jayaprakasam B 2003). Cucurbitacin, a bitter principle which is an important nutraceutical compound is predominantly found in members of Cucurbitaceae. Cucurbitacin is classified into A to S type (Liu T 2000).

Cucurbitacins are glycoside compounds present mostly in crystal form except cucurbitacin H (Chen J.C. 2005). Most of the Cucurbitacin are soluble in methanol. Cucurbitacin usually show maximum absorption at 229-398 (Everaldo Attard 2002).

The state of Maharashtra has been divided into nine Agro Climatic zone based on rainfall, soil type, vegetation and region (Report of Department of Agriculture 2017). They are as follows.

1. South Konkan coastal region
2. North Konkan coastal region
3. Western Ghat zone
4. Sub mountain transition (I) zone
5. Western Maharashtra plane Ganeshkhind transaction (II) zone
6. Scarcity zone
7. Central Maharashtra plateau zone
8. Central Vidarbha zone
9. Eastern Vidarbha zone

MATERIAL AND METHODS:-

The fruits of *Trichosanthes dioica* Roxb. were collected from various agro climatic zone of Maharashtra during summer and winter months. The plant samples were collected from the following places in the nine agro climatic zones of Maharashtra labeled as MH-1 to MH-9.

Nine Agro-climatic region and places selected for sample collection:

OBSERVATION:-

Table1. Cucurbitacin C and E Content of *Trichosanthes dioica* fruits collected in summer and winter (MEAN± SD mg /100g dry weight fruit)

Agro-climatic Zones	Places of collection	Cucurbitacin C content Summer	Cucurbitacin E content Sumer	Cucurbitacin C content Winter	Cucurbitacin E content Winter
MH-1 South Konkan Coastal Zone	Vengurla	0.1±0.005	0.1±0.005	0.59±0.005	0.59±0.01
	Chiplun	0.2±0.005	0.2±0.005	0.6±0.01	0.6±0.01
	Rajapur	0.60±0.01	0.6±0.01	0.1±0.005	0.2±0.01
MH-2 North Konkan Coastal Zone	Thane	0.60±0.005	0.61±0.01	0.1±0.005	0.2±0.005
	Karjat	0.61±0.005	0.60±0.005	0.2±0.005	0.1±0.005
	Kolad	0.6±0.005	0.3±0.01	0.62±0.01	0.59±0.01
MH-3 Western Ghat Zone	Lonawala	0.61±0.005	0.61±0.005	0.61±0.005	0.60±0.005
	Igatpuri	0.61±0.005	0.6±0.01	0.61±0.005	0.58±0.005
	Trimbak	0.60±0.005	0.6±0.01	0.62±0.01	0.60±0.005

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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 Western Maharashtra Plain Ganeshkhind (Transaction 2) zone: Dhule, Nashik, Kopargao (Ahmednagar)
 MH-6 Scarcity Zone: East Dhule (Songir), East Nashik (Malegaon), Nevasa (Ahmednagar)
 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

The fruits from the above mentioned places were collected and stored at 15°C during transportation till it reached the laboratory. It was cleaned and dried in oven at 45°C for 3 days, not exceeding four hours in a day to avoid burning. It was then powdered using mortar and pestle as per standard protocol. It was refluxed in methanol for 8-10 hours and concentrated. The working solution was made by making dilutions to 10ppm. Cucurbitacin was estimated using UV-1800 Shimadzu spectrophotometer.

All the samples were made in triplicate and measured at 328nm for Cucurbitacin C and 356nm for Cucurbitacin E (Everaldo Attard 2002). To determine Cucurbitacin content the entire spectrum was analyzed. The spectrophotometric analysis was performed as per the manual of U V spectrophotometer. After optimization as per manual the readings were obtained and calibrated using standard method. The data was then statistically analysed, by Tukey test to study value of significance. Tukey test is calculated by dividing

$$\text{a difference between two mean by } SE = \sqrt{\frac{s^2}{n}}$$

where 'n' is the number of data in each groups B and A while s^2 is the error mean square by ANOVA computation. $q = \frac{XB - XA}{SE}$, where XA and XB are mean of data and SE is standard error.

MH-4 Sub-montane (Transition 1) Zone	Surgana	0.3±0.005	0.2±0.005	0.1±0.005	0.1±0.005
	Peth	0.60±0.005	0.59±0.005	0.2±0.005	0.2±0.005
	Patan	0.60±0.005	0.59±0.005	0.60±0.01	0.59±0.01
MH-5 Western Maharashtra Plain (Transaction 2) zone	Dhule	0.61±0.01	0.61±0.005	0.59±0.005	0.58±0.005
	Nashik	0.61±0.005	0.59±0.01	0.61±0.005	0.6±0.01
	Kopargaon	0.6±0.01	0.59±0.005	0.62±0.01	0.61±0.01
MH-6 Scarcity Zone	Songir	0.60±0.005	0.60±0.005	0.60±0.005	0.59±0.01
	Malegaon	0.61±0.005	0.61±0.01	0.61±0.01	0.59±0.01
	Nevasa	0.60±0.005	0.60±0.005	0.2±0.01	0.2±0.01
MH-7 Central Maharashtra Plateau (Assured rainfall) zone	Aurangabad	0.6±0.01	0.59±0.005	0.59±0.01	0.59±0.01
	Amravati	0.59 ±0.01	0.59±0.01	0.6±0.01	0.62±0.01
	Akola	0.6±0.005	0.2±0.005	0.6±0.01	0.60±0.005
MH-8 Central Vidarbha (Moderate rainfall) zone:	Wardha	0.61±0.005	0.59±0.01	0.1±0.005	0.1±0.005
	Yavatmal	0.60±0.005	0.59±0.005	0.61±0.005	0.59±0.005
	Nagpur	0.60±0.005	0.60±0.005	0.62±0.01	0.61±0.01
MH-9 Eastern Vidarbha Zone	Gondia	0.61±0.005	0.61±0.01	0.59±0.005	0.59±0.005
	Bhandara	0.62±0.005	0.62±0.01	0.62±0.01	0.60±0.005
	Chandrapur	0.1±0.005	0.1±0.005	0.61±0.005	0.59±0.01

Table 2: Cucurbitacin Content of *Trichosanthes dioica* Roxb fruits collected from various agro climatic zones of Maharashtra in summer and winter season(mg /100 g dry weight)

Cucurbitacin	Season	Place of Collection	Highest cucurbitacin content
Cucurbitacin C	Summer	Bhandara	0.62
Cucurbitacin E	Summer	Bhandara	0.62
Cucurbitacin C	Winter	Kolad, Trimbak, Kopargaon, Nagpur, Bhandara	0.62
Cucurbitacin E	Winter	Amravati	0.62

Table-3 Statistical description

Cucurbitacin	Num ber of obser vation	Mea n	Stand ard error	Stand ard deviati on	Sample variance	Confid ence level 95%	Hypot hesis accept/ Reject
Cucurbitacin Summer C	81	0.54	0.031	0.159	0.025	0.063	Accept
Cucurbitacin Summer E	81	0.507	0.0346	0.1796	0.0322	0.071	Accept
Cucurbitacin Winter C	81	0.486	0.04	0.209	0.044	0.083	Accept
Cucurbitacin Winter E	81	0.482	0.038	0.198	0.039	0.078	Accept

Table 4- Anova

Source of Variation	SS	Df	MS	F	P-value	F crit
Rows	1.629	26	0.0626	2.428507	0.001	1.638019
Columns	0.058	3	0.0193	0.749826	0.526	2.721783
Error	2.012	78	0.0258			
Total	3.699	107				

$$\text{Standard Error: } SE = \sqrt{\frac{s^2}{n}} = \sqrt{\frac{0.0258}{27}} = 0.031$$

Table 5- Tukey's HSD (honestly significant difference) test

Cucurbitacin	q value of Tukey test	Hypothesis accept/ Reject
Cucurbitacin C content Summer and Cucurbitacin C content Winter	1.761444	Accept
Cucurbitacin E content Winter and Cucurbitacin C content Winter	0.004074	Accept
Cucurbitacin E content Summer and Cucurbitacin C content Winter	0.683009	Accept
Cucurbitacin C content Summer and Cucurbitacin E content Winter	1.893252	Accept
Cucurbitacin C content Summer and Cucurbitacin E content Sumer	1.078435	Accept
Cucurbitacin E content Summer and Cucurbitacin E content Winter	0.814817	Accept

From the above table it was observed that the higher Cucurbitacin content was observed from fruits collected in the summer. Samples collected from Bhandara was found to have higher cucurbitacin than the samples collected from other region. Bhandara is reported to high

average temperature in Maharashtra. In the present investigation Bhandara from the MH -9 zone was found to have maximum cucurbitacin content compared to the other agroclimatic region of Maharashtra. This could be due to the reason that Bhandara has high average temperature. Such observation was also made by other workers. Devendra (2011) have reported high amount of cucurbitacins in stem and leaf while low cucurbitacins content in fruit in the month of February, i.e., 0.8, 1.7 and 3.7 w/w % and in July 1.9, 0.5 and 0.17 w/w % in fruit, stem and leaves respectively, higher in fruit and lower in stem and leaf. Statistical analysis by Anova and Tukey test signifies that the value of significance is within limit and hence the hypothesis is accepted.

RESULT AND DISCUSSION:-

The range of toxicity of cucurbitacins based on few in vivo toxicity reports, Ujjawal (2015) found toxicity range between 2-12.5mg/kg. Jayaprakasam (2003) evaluated, cucurbitacin B, D, E and I for their inhibitory effects on the growth of human colon, breast, lung and central nervous system, cancer cell lines, due to high content of cucurbitacins B, D, E and I. Kirschman (1989) have stated that fruits may prove as a potent hepato-protective, anti-inflammatory, cytotoxic agent. Kaya and Melzig (2008) have observed that the content of cucurbitacin E, cucurbitacin I, were found to be 0.0065% and 0.0031%, respectively in *Gratiola officinalis* L. Present study reveals that, production of Cucurbitacin is temperature dependent and the temperature increases the cucurbitacins content. It was observed that decrease in the temperature leads to decrease in the production of cucurbitacins. Further research is require to confirm the results as cucurbitacins are most important nutraceutical found in the members of family cucurbitaceae.

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