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Comparative Analysis of Iron content of *Momordica charantia* L. and *Cucumis sativus* L. collected from the various Agro Climatic Zones of Maharashtra.

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Abstract: ***Momordica charantia L. and Cucumis sativus L. are excellent fruit vegetables in nature having iron content, as an essential constituent required for good health of humans. The iron content of the vegetables may vary from place to place depending on the soil, rainfall and other climatic conditions prevailing in that place. It was thought necessary to find out whether the environmental conditions in the nine agro-climatic zones of Maharashtra have any impact on the iron content of these fruit vegetables. The fruit vegetables were collected from various places from nine agro-climatic zones of Maharashtra classified based on rainfall, soil type and the vegetation. It was found that fruits of Momordica charantia L. showed comparatively more nutraceutical content than the fruits of Cucumis sativus L. collected in same season. It was also observed that in the nine agro-climatic zones of Maharashtra studied, the fruits of Momordica charantia L collected from Karjat of North Konkan Coastal Zone showed maximum Iron content, while fruits collected from Igatpuri of Western Ghat Zone and Nashik of Western Maharashtra Plain (Transaction 2) zone showed minimum iron content. In case of Cucumis sativus L., fruits collected from Wardha of Central Vidarbha (Moderate rainfall) zone region showed maximum iron content, while fruits collected from Surgana of Sub-montane (Transition 1) Zone showed minimum iron content.***

Keywords: Nutraceuticals, Momordica charantia L., Cucumis sativus L. Environmental factors, Iron content, Agroclimatic zones of Maharashtra.

I. INTRODUCTION

The cucurbit fruits are rich in nutraceutical with high nutrient value and immense medicinal importance. Most of the plants belonging to this family are frost sensitive and drought-tolerant (Singh, 1989). The cucurbits are easily cultivated throughout India and are easily available to the common man. They contain important nutrients such as various protein carbohydrates, minerals, vitamins, amino acids, flavanoids, Cucurbitacins etc. which are important as nutraceutical. The fruits belonging to this family are rich in iron content (Abulude 2007). *Momordica* and *Cucumis* are very important medicinal food as stated by Paul 2010 and Kamboj 2007. In Maharashtra, some of the common cultivated members of family Cucurbitaceae are *Coccinia, Trichosanthes, Momordica, Cucumis, Cucurbita* (Ram D 2002). Iron content plays an important role in metabolic activity and also has impact on nitrogen metabolism and growth (Borlotti 2012)

In the present study, 2 members of cucurbitaceae i.e, *Momordica charantia* L. commonly called Karela *and Cucumis sativus* L. commonly called Kakadi, which are easily available and affordable to common man, were selected from the nine agro-climatic zones of Maharashtra and were analysed for the iron content to find out if the environmental conditions in these areas have any effect on the iron content of these fruit vegetables.

II. MATERIAL AND METHODS

A. Plants Selected

Momordica charantia L and *Cucumis sativus* L which grow in a climate that is warm and humid and commonly found almost all over India in the wild were selected.

B. Sites Selected

The state is divided into nine agro-climatic zones on the basis of the rainfall, soil and cropping patterns. The western coastal plains have high rainfall. This region followed eastward by the ghat mountain zone, the transition zone, and the drought prone zones. The eastern zones are again characterized by moderate to high rainfall patterns. The topography of Maharashtra is characterized by a narrow coastal plain that separates the Arabian Sea from the Western Ghat Mountains.

On the eastern side of the mountains the climate is drier, and the topography is characterized by a large plateau formed by a series of tablelands that occupy most of the central part of the state.

The fruits of the selected plants were collected from the following places in the nine agroclimatic zones of maharashtra were collected during summer months of Aprl-May.

1) *MH-1 South Konkan Coastal:* Vengurla, Ratnagiri (Chiplun and Rajapur).
2) *MH-2 North Konkan Coastal Zone:* Thane, Karjat, (Kolad)Raigad
3) *MH-3 Western Ghat Zone:* Lonawala, Igatpuri, Trimbak
4) *MH-4 Sub-montane (Transition 1) Zone:* Surgana, Peth, Patan
5) *MH-5 White star Western Maharashtra Plain (Transaction 2) zone:* Dhule, Nashik, Shirdi
6) *MH-6 Scarcity Zone:* East Dhule (Songir), East Nashik (Malegaon), Nevasa (A.nagar)
7) *MH-7 Central Maharashtra Plateau (Assured rainfall) zone:* Aurangabad, Amravati, Akola
8) *MH-8 Central Vidarbha (Moderate rainfall) zone:* Wardha, Yawatmal, Nagpur
9) *MH-9 Eastern Vidarbha Zone:* Gondia, Bhandara, Chandrapur.

a) *Iron Estimation Method:* Determination of Iron in the Fresh Fruit vegetables were done by using, i.e. Farrar (1935) method.
b) *Observation:* The fruit samples of *Momordica charantia* L. were collected during the summer season from nine Agroclimatic zones of Maharashtra (Agriculture statistical information, 2002). Iron content was found to be maximum i.e. 3.5 mg/100g (Table No. 1) in the samples collected from Karjat which is in MH-2 North Konkan Coastal Zone. The data collected was statistically analysed

The p value was found to be 0.68 and the f calculated value 0.39. which was lower than f critical value of 3.63 hence all the results were significant and the null hypothesis was accepted (Table No. 3). Honest significance of difference (HSD) value was calculated as 1.56. The q value was in between 0 to 1.56. (Table No. 2). The fruit samples of *Cucumis sativus* L. were collected during the summer season from nine agro climatic zones of Maharashtra (Agriculture statistical information, 2002). Iron content was found to be maximum i.e. 4.2 mg/100g (Table No. 1) in the samples collected from Wardha which is in MH-8 Central Vidarbha (Moderate rainfall) zone. The p value was found to be 0.06 and the f calculated value 3.34. which was lower than f critical value of 3.63 hence all the results were significant and the null hypothesis was accepted (Table No. 3). Honest significance of difference (HSD) value was calculated as 1.83. The q value was in between 0 to 1.83 (Table No. 2).

Table no. 1 Iron content of *Momordica charantia* L. and *Cucumis sativus* L. fruits (mg /100g dry weight)

Places of Collection	***Momordica charantia* L.**	***Cucumis sativus* L.**
Vengurla	1.8±0.1	1.5±0.1
Chiplun	1.5±0.11	1.4±0.1
Rajapur	1.4±0.05	1.1±0.11
Thane	2.3±0.05	2.5±0.15
Karjat	3.5±0.15	1.1±0.15
Kolad	1.3±0.1	1.3±0.1
Lonawala	1.8±0.1	2±0.2
Igatpuri	0.9±0.11	1.3±0.1
Trimbak	1.1±0.15	1.2±0.05
Surgana	1.7±0.15	0.9±0.1
Peth	1.8±0.15	1.1±0.1
Patan	1.6±0.15	1.5±0.11
Dhule	1.3±0.1	1.4±0.21
Nashik	0.9±0.15	1.4±0.1
Kopargaon	1.5±0.15	1.2±0.15
Songir	2.5±0.11	2.3±0.05
Malegaon	1.2±0.15	2.3±0.05
Nevasa	1.8±0.15	1.5±0.15
Aurangabad	2.5±0.15	1.4±0.2

Amravati	2.1±0.05	1.7±0.15
Akola	2.2±0.05	1±0.15
Wardha	1.1±0.1	4.2±0.21
Yavatmal	1±0.1	0.9±0.15
Nagpur	1.3±0.05	1.5±0.11
Gondia	1.1±0.11	2.2±0.1
Bhandara	1.3±0.15	2.3±0.11
Chandrapur	2.3±0.15	1.3±0.15

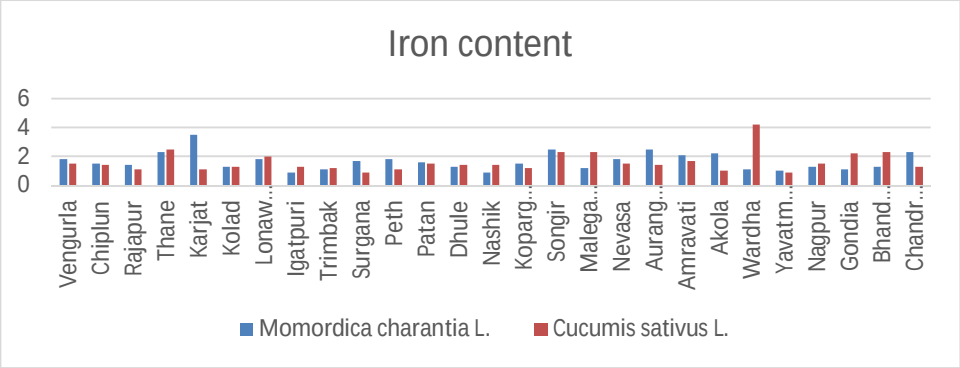
Table no. 2 Iron content of *Momordica charantia* L. and *Cucumis sativus* L. fruits. Honest significance of difference (HSD) by Tukey test(mg /100g dry weight)

Comparison between Agroclimatic region	HSD Value 1.56 Null hypothesis to be accepted or rejected *Momordica charantia* L.	HSD Value 1.83 Null hypothesis to be accepted or rejected *Cucumis sativus* L.
MH 1 & MH 2	2.55	0.81
MH 1 & MH 3	0.95	0.45
MH 1 & MH 4	0.42	0.45
MH 1 & MH 5	1.06	0
MH 1 & MH 6	0.85	1.89
MH 1 & MH 7	2.23	0.09
MH 1 & MH 8	1.38	2.35
MH 1 & MH 9	0	1.62
MH 2 & MH 3	3.5	0.36
MH 2 & MH 4	2.12	1.26
MH 2 & MH 5	3.61	0.81
MH 2 & MH 6	1.7	1.08
MH 2 & MH 7	0.32	0.72
MH 2 & MH 8	3.92	1.53
MH 2 & MH 9	2.55	0.81
MH 3 & MH 4	1.38	0.9
MH 3 & MH 5	0.11	0.45
MH 3 & MH 6	1.8	1.44
MH 3 & MH 7	3.18	0.36
MH 3 & MH 8	0.42	1.89
MH 3 & MH 9	0.95	1.17
MH 4 & MH 5	1.48	0.45
MH 4 & MH 6	0.42	2.35
MH 4 & MH 7	1.8	0.54
MH 4 & MH 8	1.8	2.8
MH 4 & MH 9	0.42	2.08
MH 5 & MH 6	1.91	1.89
MH 5 & MH 7	3.29	0.09
MH 5 & MH 8	0.32	2.35
MH 5 & MH 9	1.06	1.62
MH 6 & MH 7	1.38	1.8
MH 6 & MH 8	2.23	0.45
MH 6 & MH 9	0.85	0.27
MH 7 & MH 8	3.61	2.26
MH 7 & MH 9	2.23	1.53
MH 8 & MH 9	1.38	0.72

Table no. 3 ANOVA Iron content of *Momordica charantia* L. and *Cucumis sativus* L. fruits.

Statistical Parameter	*Momordica charantia* L Value	*Cucumis sativus* L. Value
P value	0.68	0.06
F value	0.39	3.34
F. critical	3.63	3.63
SE value	0.31	0.37

Graph no.1 Iron content mg/100 g fresh weight in the 9 Agro-climatic zones of Maharashtra



III. RESULTS AND DISCUSSION

Iron content of *Momordica charantia* L. and *Cucumis sativus* L. fruits collected from the nine Agroclimatic zones of Maharashtra was studied. *Momordica charantia* L. was found to have higher iron content than *Cucumis sativus* L. In the *Cucumis sativus* L. it was observed the iron content was found in the range between 0.9-4.2 mg/100g while in the fruits of Momordica *charantia* L. it was observed in the range between 0.9-3.5 mg/100g. Essein et. al (2016) and Bakare 2010 have also worked on these and have made similar observations.

IV. CONCLUSION

Iron content in the fruits collected from various places in the nine Agroclimatic zones of Maharashtra showed a variation. The fruits of *Momordica charantia* L. contain maximum iron content i.e 3.5 mg/100g dry weight in the fruits collected from Karjat in north Konkan coastal zone while *Cucumis sativus* fruits were found to have maximum iron content i.e. 4.2mg/100g dry weight in the fruits collected from Wardha Central Vidarbha zone. Lowest amount of iron content are present in the fruits of *Momordica charantia* collected from Nashik and Igatpuri while in case of *Cucumis sativus*,lowest Lowest amount of iron content are present in the fruits collected from Surgana and Yevatmal. Such information can be useful to the nutraceutical companies while selection of fruits for maximum nutraceutical value.

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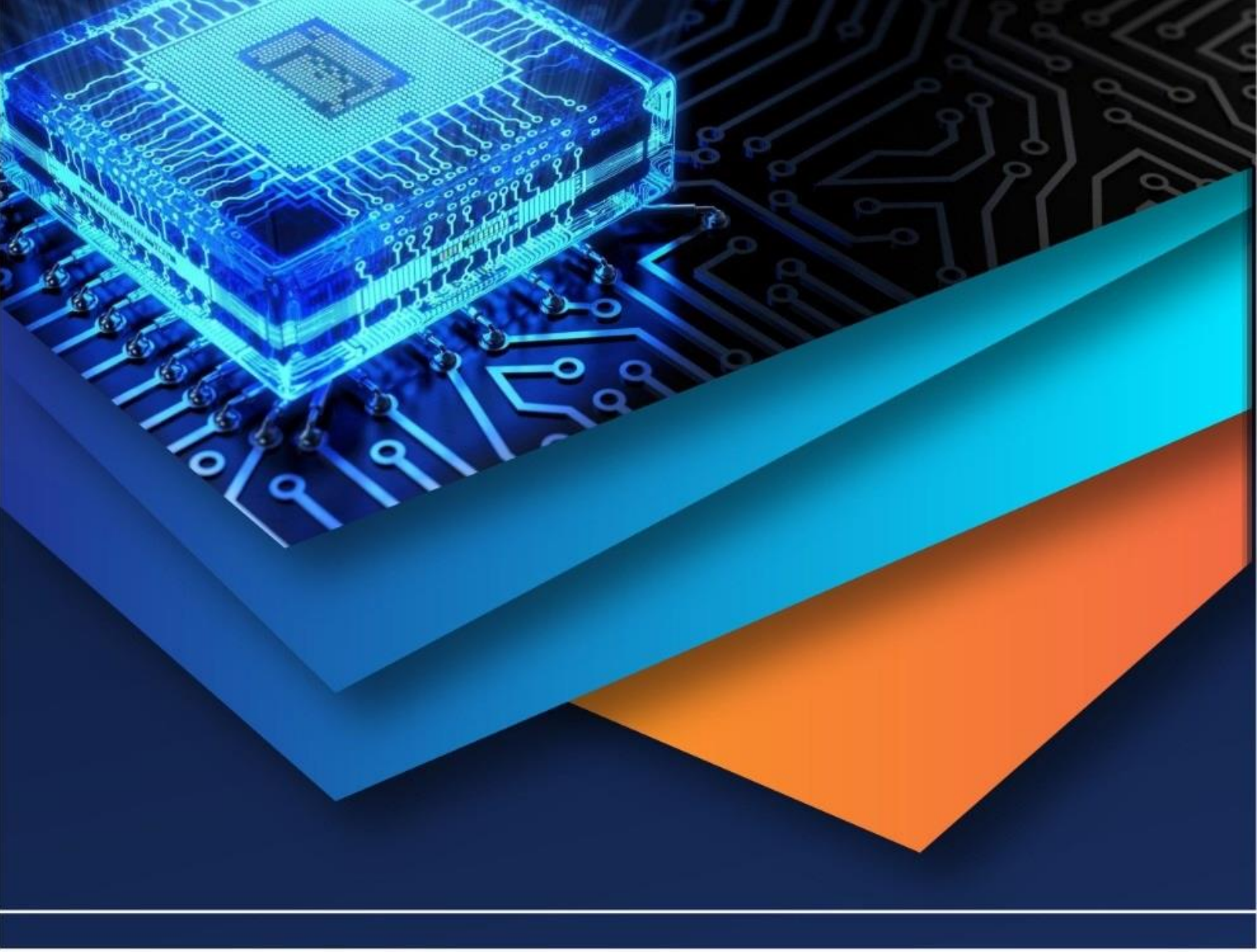

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