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Estimation of Capciacin content in different Red Chilli varieties by UV - Spectrophotometer

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Abstract:

The major focus of the present study was to estimation and comparison of capsaicinoids in different verities of Chillies samples. For this, popular agricultural verities of Chiili (Ellachipur sannam, Kashmir chilli, Byadagi, Gutnur sannam, Hindupur variety, Birds eye chilli, Jwala) samples has been collected. The grounded chilli samples were subjected to soxhlet extraction with tetrahydrofuran as a solvent. Measurements of the concentration of capsaicin in the extracts were evaluated through their absorbencies measured on λ=280nm by UV spectrophotometer. The amount of capsaicin in sample extracts was calculated using the following equation (y = 0.755x + 0.047). Among the seven verities of chilli samples Birds Eye Chilli (0.71%), Jwala (0.61%) verities were found high yield of Capsaicinoid and Byadagi (0.22%), Hindpur (0.21%) verities were found less in capsaicinoid quantity.

Capsaicin Introduction:

Capsaicin is an active component of chili peppers, which plants are belonging to the genus *Capsicum.* Pure capsaicin is a non-volatile, hydrophobic, colorless, highly pungent [2], crystalline to waxy compound and chemical name of the Capsaicin is 8-methyl-*N*-vanillyl-6-nonenamide. Capsaicin is present in large quantities in the placental tissue (which holds the seeds), the internal membranes and, to a lesser extent, the other fleshy parts of the fruits of plants in the genus *Capsicum* [33]. Capsaicin and several related compounds are called capsaicinoids and are produced as secondary metabolites by chili peppers, probably as deterrents against certain mammals and fungi [3]. The most commonly occurring Capsaicinoids are capsaicin (69%), Dihydrocapsaicin (22%), Nordihydrocapsaicin (7%), Homocapsaicin (1%), and Homodihydrocapsaicin (1%) [17].

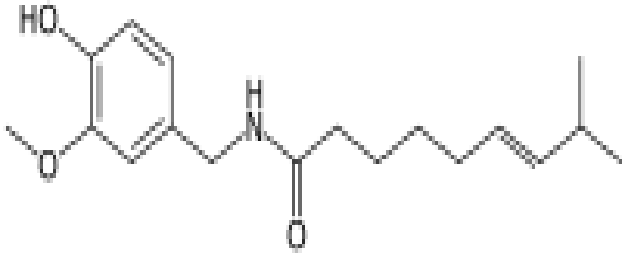

Figure 1: Chemical structure of Capsaicin

It is an irritant for mammals, including humans, and produces a sensation of burning in any tissue with which it comes into contact. Because of the burning sensation caused by capsaicin when it comes in contact with mucous membranes, it is commonly used in food products to provide added spice or "heat" (piquancy), usually in the form of spices such as chili powder and paprika [37]. Capsaicin is also an active ingredient in riot control and personal defense pepper spray agents [45-47]. Capsaicin is used as an analgesic in topical ointments, nasal sprays (Sinol-M), and dermal patches to relieve pain, typically in concentrations between 0.025% and 0.1% [39]. It may be applied in cream form for the temporary relief of minor aches and pains of muscles and joints associated with arthritis, backache, strains and sprains, often in compounds with other rubefacients. it's been used for many years to treat pain related to **osteoarthritis, rheumatoid arthritis** and **fibromyalgia**, as well as certain kinds of joint pain. Capsaicin is also used by people with the skin disease psoriasis to decrease itching and inflammation. Some research has also suggested that capsaicin can also help with appetite suppression. As Capsaicin has been have many food and medicinal application the present study is aimed to study the Capsaicin content in different varieties of chillies.

Instrumentation:

Teccomp UV-2301 double beam UV-Visible spectrophotometer was used to carry out spectral analysis and the data was recorded by Hitachi software. Standard cuvettes of 10mm path length are used for analysis. Soxhlet apparatus is used to extraction of capsaicin from chilli samples. Standard chromium was weighed by using Denver electronic analytical balance (SI-234).

Chemicals used:

Standard capsaicin, purchased from Sigma Chemical, Bengaluru. Tetrahydrofuran of make Merck purchased from Mumbai, Different varieties of chilli samples (Ellachipur sannam, Kashmir chilli, Byadagi, Gutnur sannam, Hindupur variety, Birds eye chilli, Jwala) (figure 1) were collected from Agricultural market yard, Guntur, AP.

Preparation of standard Capsaicin:

The standard Capciacin (10mg) was weighed accurately and transferred to volumetric flask (10ml). It was dissolved properly and diluted up to the mark with diluents prepared by mixing methanol to obtain final concentration of 1000 µg /ml.

Extraction:

Preparation of Chilli Powder extracts:

The extract was prepared employing Soxhlet extraction method. About 5gm of dried chilli powder material was uniformly packed into a thimble and extracted with THF (figure 2). The process of extraction continues for 24 hours or till the solvent in siphon tube of an extractor become colorless. After that the extract was taken in a beaker and kept on hot plate and heated at 30-40ºC till all the solvent got evaporated. Dried extract was kept in refrigerator at 4^0C for their future use in Capciacin analysis.

Results and discussion:

Measurements of the concentration of capsaicin in the extracts were evaluated through their absorbencies measured on λ=280nm. A simple linear regression curve was plotted using standard capsaicin, purchased from Sigma Chemical. A stock solution of 1mg/ml capsaicin in Tetrahydrofuran prepared and different concentrations from 0.2-1.2µg/ml were prepared from the stock solution (table 1). The absorbencies for standard dilutions were also measured and used to prepare the linearity curve presented on figure 3. The Capsaicinoid extracted from solvents was estimated by UV visible spectrophotometer. The crude extract was diluted by using the respective solvent. The optical density was recorded at 280nm. The amount of capsaicin in sample extracts was calculated using the following equation (y = 0.755x + 0.047) for UV spectrophotometer estimation (Figure 3) for the total capsaicin estimation.

Various Agricultural verities of Chilli samples (Ellachipur sannam, Kashmir chilli, Byadagi, Gutnur sannam, Hindupur variety, Birds eye chilli, Jwala) have been selected for estimation of capsaicinoid concentrations. All the samples were grounded and subjected to Soxhlet extraction by using the tetrahydrofuran. Capsaicinoid concentrations in the samples were estimated calculated using capsaicin linear regression equation. The capsaicinoid content was found to be Birds Eye Chilli (0.71%), Byadagi (0.21%), Guntur Sannam (0.28%). Hindpur (0.21%), jwala (0.61%), Kashmir variety (0.37%) and Ellachipur Sannam(0.25%) respectively. Among the seven verities of chilli samples Birds Eye Chilli (0.71%), jwala (0.61%) verities were found high yield of capsaicinoid and Byadagi (0.22%), Hindpur (0.21%) verities were found less in capsaicinoid quantity.

Figure 2: Different verities of chili samples selected for analysis

Figure 3: Soxhlet extraction of capsaicinoid from chilli samples

S No	Parameter	Results
1	Wavelength maxima	280nm
2	Beers Law Range	0.2-1.2µg/ml
3	Slope	0.755
4	Intercept	0.047
5	r^2	0.999

Table 1: Regression equation of Capsaicin standard

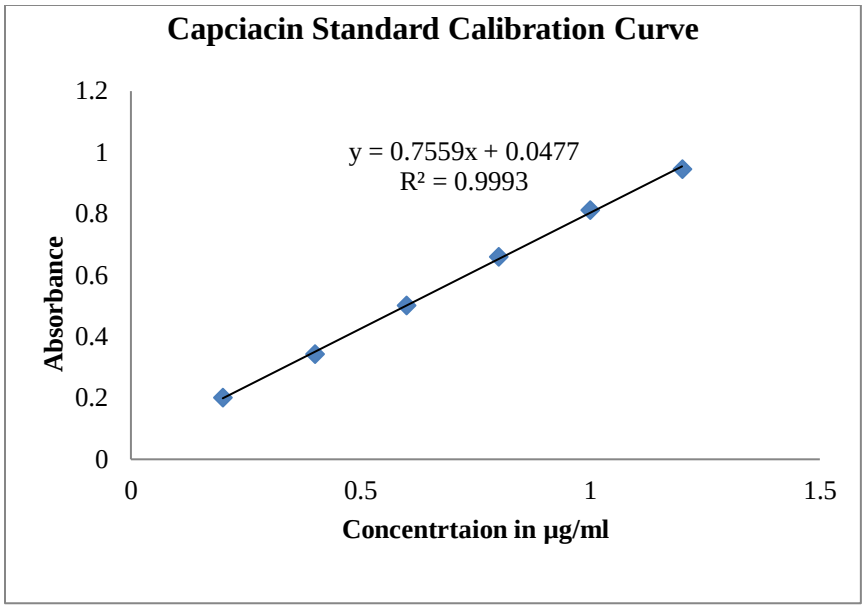

Figure 4: standard calibration curve of Capsaicin

S No	Name of the variety	% Capsacin Content
1	Birds Eye Chilli	0.71
2	Byadagi	0.22
3	Guntur Sannam	0.28
4	Hindpur	0.21
5	jwala	0.61
6	Kashmir variety	0.37
7	Ellachipur Sannam	0.25

Table 2: Amount of Capsacin found in the selected verities of Chilli samples

References:

1. Zeid Abdullah Al Othman, Yacine Badjah Hadj Ahmed, Mohamed Abdelaty Habila and Ayman Abdel Ghafar, Determination of Capsaicin and Dihydrocapsaicin in *Capsicum* Fruit Samples using High Performance Liquid Chromatography, *Molecules* 2011, *16*, 8919-8929.
2. C.O. Nwokem, E.B. Agbaji, J.A. Kagbu, E.J. Ekanem, Determination of Capsaicin Content and Pungency Level of Five Different Peppers Grown in Nigeria, New York Science Journal, 2010;3(9).
3. Ana Garcea S-Claver, Mariaa S. Arnedo-Andrea S, Javier Abadiaa, Ramiro Gil-Ortega, And Ana Aa Lvarez-Fernaa Ndez, Determination of Capsaicin and Dihydrocapsaicin in Capsicum Fruits by Liquid Chromatography□Electrospray/Time-of-Flight Mass Spectrometry, Journal of agricultural and food Chemistry, 2006, 54, 9303-9311.
4. Koleva G. Liljana, Maksimova Viktorija, Serafimovska D. Marija, Gulabovski Rubin, Ivanovska J. Emilija, The effect of different methods of extractions of capsaicin on its content in the capsicum oleoresins, Scientific Works Volume Lx „Food Science, Engineering And Technology 2013, 18-19, 2013.
5. *Yan-Yan Dang, Hua Zhang and Zhi-Long Xiu*, Three-liquid-phase Extraction and Separation of Capsanthin and Capsaicin from *Capsicum annum* L.,*Czech J. Food Sci. Vol. 32, 2014, No. 1: 109–114.*
6. Ida Musfiroh, Mutakin Mutakin, Treesye Angelina, Muchtaridi Muchtaridi, capsaicin level of various capsicum fruits, International Journal of Pharmacy and Pharmaceutical Sciences, Vol 5, Issue 1, 2013.

7. Ginpreet. Aneja, Urja. Dave and K. Vadodaria, simultaneous estimation of piperine, quercetin, and curcumin in a mixture using u.v-visible spectrophotometer and method validation, International Journal of Therapeutic Applications, Volume 8, 2012, 14 – 17.
8. D. Ashwini, Ms. G. Usha Sree, Mrs. A. Ajitha, Dr. V. Uma Maheswara Rao extraction of capsaicin from *capsicum frutescens.l* and its estimation by rp-hplc method, world journal of pharmacy and pharmaceutical sciences, Vol 4, Issue 09, 2015.
9. Maksimova Viktorija, Koleva G. Liljana, Ruskovska Tatjana, Cvetanovska Ana, Gulaboski Rubin, Antioxidative effect of *Capsicum* oleoresins compared with pure capsaicin, *IOSR Journal Of Pharmacy, Volume 4, Issue 11 (November 2014), PP. 44-48.*
10. Nagoth Joseph Amruthraj, Preetam Raj. J.P., Antoine Lebel. L, Impact of Organic Solvents in the Extraction Efficiency of Therapeutic Analogue Capsaicin from *Capsicum chinense* Bhut Jolokia Fruits, International Journal of Pharmaceutical and Clinical Research 2014; 6(2): 159-164.
11. Margaret D. Collins, Loide Mayer Wasmund, and Paul W. Bosland, Improved Method for Quantifying Capsaicinoids in *Capsicum* Using Highperformance Liquid Chromatography, Hortscience 30(1):137–139. 1995.
12. Magaji G. Usman, Mohd Y. Rafii, Mohd R. Ismail, Md. Abdul Malek and Mohammad Abdul Latif, Capsaicin and Dihydrocapsaicin Determination in Chili Pepper Genotypes Using Ultra-Fast Liquid Chromatography, *Molecules* 2014, *19*, 6474-6488.