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A Comparative Study of Solvent Polarity on Qualitative and Quantitative Phytochemical Content and Antioxidant Activities of Root Extract of Costus Speciosus

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Abstract - *Costus speciosus* is an natural medicinal and ornamental plant. The plant has been found to possess many pharmacological activities such as antibacterial, antifungal, antioxidant, and estrogenic activity. The root of *Costus speciosus* are bitter, astringent, acrid, cooling, aphrodisiac, purgative, anthelminthic, depurative, febrifuge, expectorant, tonic, improve digestion, and is a stimulant herb that clears toxins. It also has anti-fertility, anabolic properties. One such medicinally important plant *Costus specious* was chosen and the present study was designed to perform preliminary phytochemical analysis of various extracts of *Costus specious* root viz. ethanolic (CSEE), hexane (CSHE), methanol (CSME), chloroform (CSCE). In addition, total phenolic (TPC) contents of various extracts were measured, also the various extracts were evaluated for the antioxidant capacities using most widely accepted *in vitro* chemical tests such as DPPH free radical scavenging assays.

Keywords *Costus speciosus,* Antioxidant, Free radical

1. *Introduction*

Costus speciosus (Koening) Smith belongs to the family Costaceae, is an herbaceous plant. It is commonly called "Crepeginger" **(Bhogaonkar *et al*., 2012).** It is widely distributed in central parts of India, Sub-Himalayan tract, Karnataka, Western ghats of Maharashtra and Kerala **(Sabitha *et al*., 2010).** There are more than 100 species of costus. The plant is a perennial, rhizomatus herb with erect or spreading stem **(Gupta *et al*., 2012).** The plant reproduces vegetatively by rhizome or stem cutting. *Costus speciosus* is popularly known as kemuka, Kushta, Kashmira, Shura, Katar katar in Sanskrit, Keu in Hindi and , Crepe ginger in English. The genus Costus is consist of 175 species. **(Pawar V. A. and Pawar P. R. 2014).**

2 Materails and Method

2.1 Plant material Collection The samples were collected from Niglat, Bhowali in Nainital district of Uttarakhand state (India). at an altitude of (5,427ft). Details of accessions Ic-627251/KMR-15, (ICAR-NBPGR) in the month of 15 January 2020**.**

The present study was conducted to evaluate the qualitative and quantitative phytochemical analysis; antioxidative potential of different extracts viz. methanol, ethanol, hexane and chloroform of *Costus speciosus root.*

2.3 Major equipments and glassware used in study

UV Spectrophotometer (Ray Leigh UV-2601), pH meter (Systronics), Electronic Balance(Citizen), Laminar Air Flow System (Maro scientific work), Autoclave (Macro scientific work), Microwave oven (Kenstar), Magnetic vortex stirrer (Mac), Micropipettes (Accupipet), Refrigerator (Whirlpool), Water Bath(Mac).

3 Result

3.1 Percentage yield of various extracts of *Costus specious*

Extraction involves the use of an inert solvent which actively separates the molecules from the plant parts. The extracts obtained with various solvents (methanol, chloroform, ethanol and hexane) were weighed and their percentage yield were calculated **(Ruwali *et al*., 2015)** as compared to the initial weight of the plant material, to get the extractive values and are presented in **table 3.1:**

Table 3.1: Percentage yield of different extracts of *Costus speciosus*

Extract with different solvents	Percentage yield
CSEE	5.82
CSHE	3.62
CSME	2.93
CSCE	1.27

Percentage Extraction Yield = W_E / W_S× 100

Where, (W_E = Weight of the plant extract; W_S = Weight of the initial sample

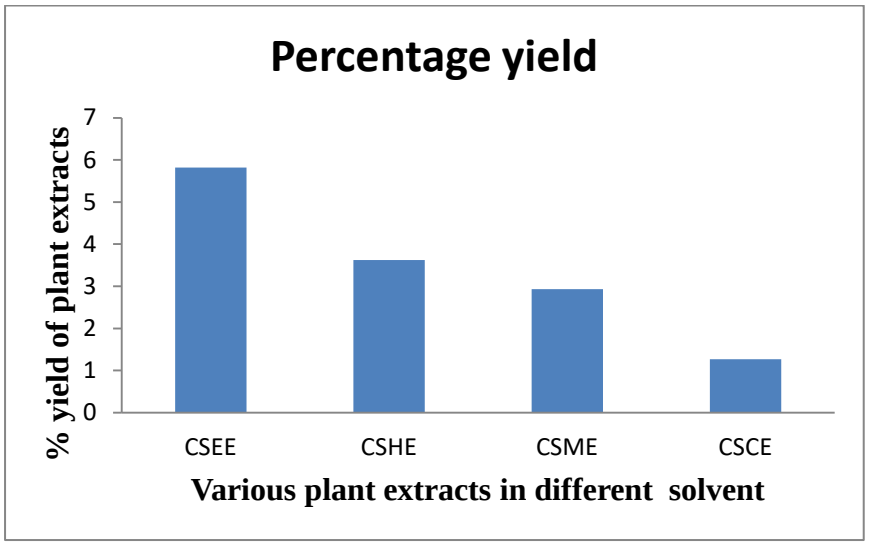


Fig. 1: Percentage yield of different solvent extracts of *Costus speciosus*

4 Phytochemical analysis of various extracts of *Costus speciosus*

4.1 Qualitative phytochemical analysis of various extracts of *Costus speciosus*

Phytochemicals synthesized by plants have long been used in the treatment of many ailments. Understanding the nature of phytochemicals becomes an integral part in any study involving these metabolites. A large number of phytochemicals possessing numerous activities have been isolated from plants. The crude extracts from different solvents of the plant were investigated for the presence of various classes of phytochemicals by performing appropriate tests.

Out of the total of 10 Phytochemicals targeted, carbohydrates, reducing sugars, amino acids and flavonoids were detected in all four extracts. triterpenes were present in methnol but absent in ethanolic extract. Tannin and Phenol were present only in ethanolic extract.

4.2 Quantitative phytochemical analysis of various extracts of *Costus speciosus*

Various extracts of *Costus speciosus* were subjected to the estimation of total phenolics concentration using standard methods.

4.3 Total phenolic concentration of various extracts of *Costus speciosus*

The total phenolics of various extracts were assessed and expressed as mg GAE/gm of dry weight of the extract. The content of phenolics varied among different extracting solvents used.

Ethanol extract had the highest phenol contents of 99.70 mg GAE/gm followed by Hexane (92.63mg GAE/gm) and Methnol (80.26mg GAEgm). The lowest phenolics contents were found in the chloroform extract 63.54mg GAE/gm.

5 Antioxidant activity of root extracts of *Costus speciosus*

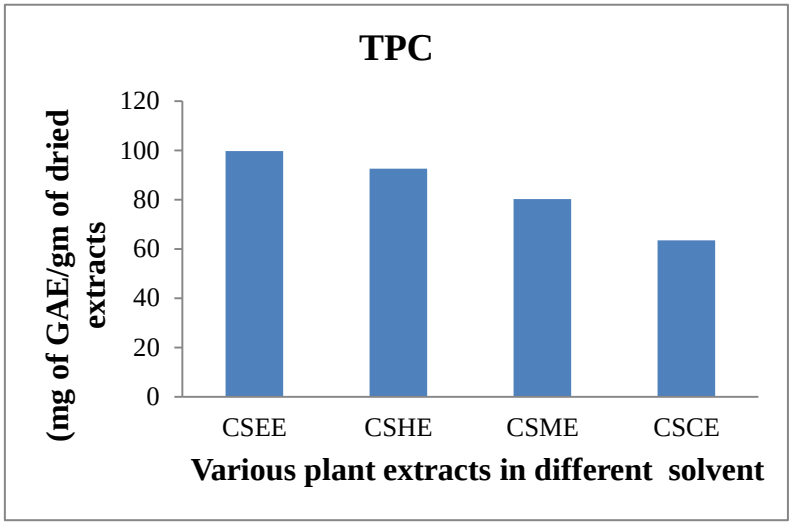


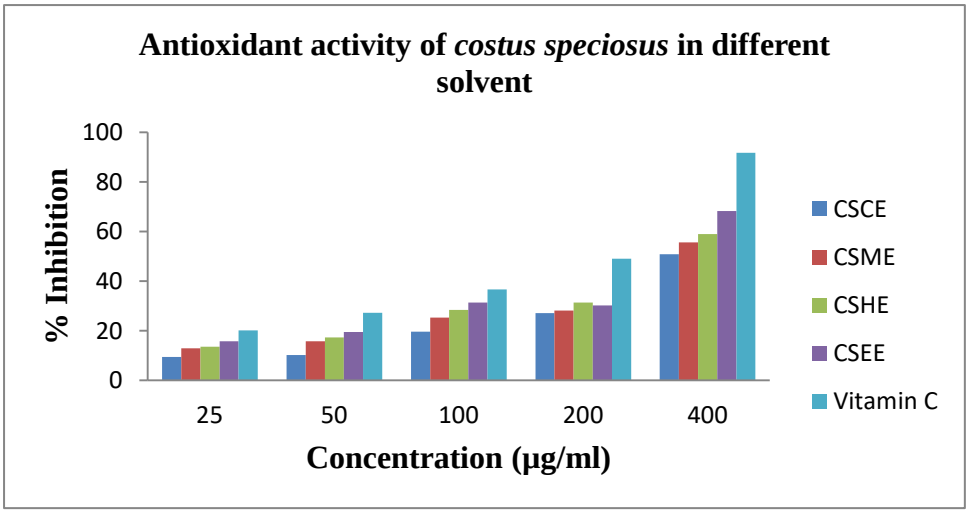
Fig 2: Total Phenolic contents of various extracts of *Costus speciosus*

Antioxidant activity of extracts of *Costus speciosus* were assessed by standard and currently most accepted methods *viz*. DPPH stable free radical scavenging assay.

5.1 DPPH free radical scavenging activity of various extracts of *Costus speciosus*

The DPPH radical model is a widely used, quick and precise method for the evaluation of free radical scavenging activity. Antioxidant activity of Vitamin C and various plant extracts were assessed by following standard protocol. DPPH is stable nitrogen centred free radical which can be effectively scavenged by antioxidants and shows strong absorbance at 517 nm. The change in absorbance of DPPH radical caused by the sample was due to the reaction between the antioxidant molecules and the sample, which resulted in the scavenging of the radical by hydrogen donation. **(Suresh *et al., 2008)*** It was visually noticeable as a discoloration from purple to yellow. Extent of DPPH radical scavenged was determined by the decrease in intensity of violet colour in the form of IC_{50} values. When a donor of hydrogen atom is added to a DPPH solution, a change in the coloration from violet to yellow occurs, which can be measured by UV-VIS spectroscopy at the 518 nm.

5.2 DPPH free radical scavenging activity of various extracts of *Costus speciosus*



DPPH free radical scavenging activity of various extracts of *Costus speciosus*

DPPH is a stable free radical. On accepting hydrogen from a corresponding donor, its solution loses the characteristic deep purple **(**λmax 515-517nm) colour. DPPH is a very popular for the study of natural antioxidant. DPPH stable free radical method is a sensitive way to determine the antioxidant activity of plant extract **(Suresh *et al.*, 2008)**. The amount of antioxidant activity present in solvent were in the order of Ethanol > Hexane > Methanol > Chloroform.

The antioxidant activity of the sample is evaluated from determination of IC_{50} values corresponding to the amount of extract of various extracts required to scavenge 50% of DPPH radical present in the reaction mixture. Lower IC_{50} values indicate higher radical scavenging ability.

5.3 IC_{50} values of vitamin C and various plant extracts.

SAMPLE	IC_{50} Value(µg/ml)
Vitamin C	86.67
CSEE	143.93
CSHE	157.91
CSME	206.25
Chloroform	263.02

Result showed in **Table 5.3.**reported IC_{50} of all extracts of, however ethanolic extract of *Costus speciosus* being the lowest which means among all extracts it has higher antioxidant activity.

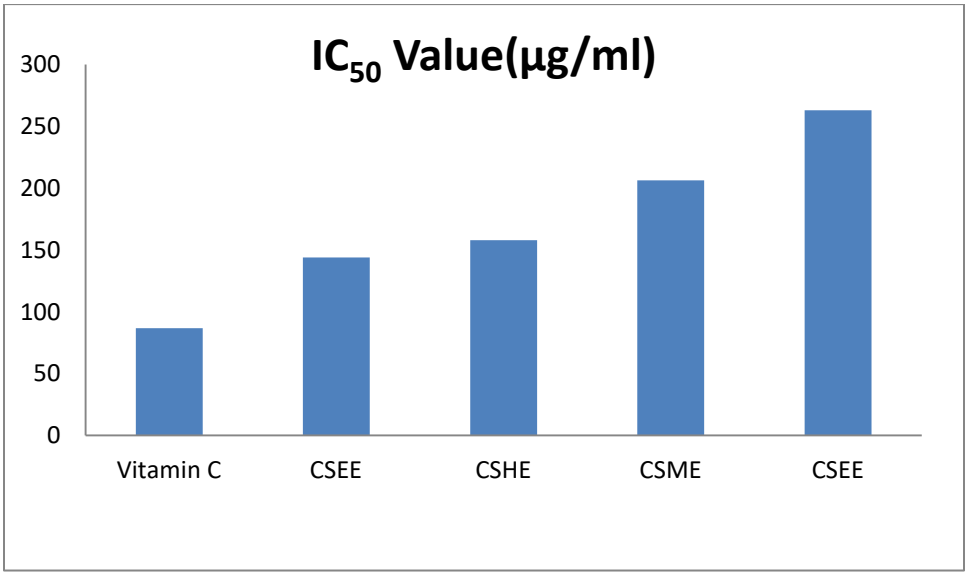


Fig. 4. IC_{50} of Ascorbic acid and various plant extracts

Fig.4: shows the comparison of DPPH free radicals scavenging activity of various extracts of *Costus speciosus.* IC_{50} values varied from 143.93µg/ml for ethanolic extract (the most active) to 157.91µg/ml fore hexane extract and 157.91µg/ml for the ethanol to 206.25µg/ml for chloroform extract (the least active). It indicates that ethanolic extract have maximum while, chloroform sample had least antioxidant activity and this analysis also reveal that is a positive correlation between IC_{50} and total phenolic concentration.

IC_{50} value is defined as the concentration of substrate that causes 50% loss of the DPPH activity and was calculated by linear regression mentioned of plots of the percentage of antiradical activity against the concentration of the tested compounds.

References

1) **Bhogaonkar, P. Y., Devarkar, V. D. and Lande, S. K.** Physical Characterization of Costus speciosus (Koenig Ex Retz.) smith_A well known Ayurvedic drug plant. Life sci. leafl. 11:19. (2012).
2) **Gupta, R. K.** Antiinflammatory, Analgesic and Antipyretic Activities of Aerial Parts of *Costus speciosus* (Koen). Indian J Pharm Sci. 70-78. (2013).
3) **Kumar, S., Shukla, R. S., Singh, K. P., Paxton, J. D. and Husain, A.** Glyceollin : A Phytoalexin in Life Blight of Costus speciosus. Phytopathology. 74; 1349-1352. (1984).
4) **Pawar, V. A. and Pawar P. R.** Costus speciosus; An Important Medicinal Plant. Int. J. Sci. Res. 28-33. (2017)
5) **Ruwali, P. Ambwani, T., Gautam, P. and Thapliyal, A.** Qualitative and quantitative phytochemical analysis of Artemisia indica Willd. J. Chem. Pharm. Res. 7(4): 942-949. **(2015)**.
6) **Sabitha, R., Sulakshana, A. and Patnaik, G. S.** Costus speciosus, An Antidiabetic Plant-review. (F S. J). Pharm Res. 1; (3). (2012).
7) **Suresh, P. Sucheta, K. S.. Sudarshana., V. Selvamani., D. P. and Latha, S.** Antioxidant activity in some selected Indian medicinal plants. Afr. J. Biotechnol. 7 (12); 1826-1828. (2008).