

Research Article

Pharmacognostical investigation and standardization of *capsicum annuum* l. Roots

Pandey Sunil*, Yadav Sanjay, Singh Vinod

Department of pharmacy, Saroj Institute of Technology & Management, Ahimamau , Post office: Arjunganj, Lucknow, 226002, (U.P.), India

ABSTRACT

Capsicum annuum L. is one of the most economical and agriculturally important vegetable crops all over the world. Pepper is an autogamous plant, native to tropical America, which belongs to the Family Solanaceae. The red pepper is experiencing a rediscovery among health care practitioners, who have only just begun to uncover its marvelous therapeutic actions. It has been referred to as the purest and most effective natural stimulating botanical in the herbal medicine chest. It is commonly known as Red pepper in English and Mirchi in Hindi. Microscopy of the root shows radial type vascular bundle, xylem is exarch, that is protoxylem is towards the periphery and metaxylem towards centre. Successive extractive value was highest in aqueous extract 3.40% (on dry weight basis). Mean ash value (%) were 9.27 (total), 0.74 (acid insoluble ash), and 1.49 (water soluble ash). Loss on drying was found to be 8.90%, total alcoholic-soluble extractive value 3.54% and total water-soluble extractive value 9.32% . Screening of all extracts indicated the presence of all constituents. TLC fingerprinting of different extract were also developed which showed a number of bands.

Key words: *Capsicum annuum*, Red pepper, Mirchi, Solanaceae, capsaicin.

INTRODUCTION

Capsicum annuum L. is an important part of human diet since 7500 BC¹. The genus *Capsicum* consists of about 22 species in which five being domesticated² viz. *C. annuum*, *C. chinese*, *C. frutescense*, *C. pubescense* and *C. baccatum*. Varieties of the papper are scaled by pungency test for their pungency measured in terms of Scoville Heat Units. Evaluation of pungency of *Capsicum* was devised by Scoville in 1912, according to which *Capsicum* has been divided in to five important groups viz. non-pungent Paprika (0-700SHU), mildly pungent (700-3000SHU), moderately pungent (3000-25,000SHU), highly pungent (25,000-70,000SHU) and very highly pungent of above 80,000SHU³. At this pungency scale Bell pepper is given '0' value. The importance of pungency of the pepper is lead to the presence of capsaicinoids, the vanillyl amide units, mainly capsaicin present in highest concentration in placental tissue followed by fruits and seeds. The fruits with seeds are used commonly in spices and food due to their pungent flavour, known to possess several medicinal properties like anti-inflammatory, analgesic, carminative, rubefacient³ and recently its antioxidant⁴, hypoglycemic⁵, antifungal⁶ and antimicrobial⁷ activities have been established. These medicinal properties of *C. annuum* make it popular in both Ayurveda and Homoeopathy system of medicin. It is a important herbaceous annual plant with glabrous pubescent, lanceolate leaves, white flowers and seeded fruits⁸.

Capsicum contains about 0.5% to 0.9% colourless, crystalline and pungent principle, known as capsaicin which is volatile above 65 degree centigrade⁹. Chillies also contain ascorbic acid (0.1-0.5%), thiamine, red carotenoids such as capsanthin and capsorubin and fixed oil (4-16%). The pungent phenolic fraction of capsicum also contain a proportion of 6, 7 dihydrocapsaicin. The capsaicin content of fruits varies appreciably in a range up to 1.5% and is much influenced by environmental conditions and age of fruit. In a study of water soluble constituent of three varieties of *C. annuum*, Izumitani et al (Chem.Pharm.Bull,1990,38,1299) isolated twelve novel acyclic glycosides (geranyllinalool derivatives) named capsainoside A-F (dimeric esters of acyclic diterpene glycoside). The red paprika (*Capsicum annuum* var. Longum nigrum) contain a carotenoid, cycloviolaxanthin[(3S,5R,6R,3'S,5'R,6'R)-3,6,3,6'-diepoxy-5,6,5',6;-tetrahydro-beta, beta carotene-5,5'-diol] besides 5,6-epoxycapsanthin, (8S)-capsochrome, karpoxanthin and violaxathin, cucurbitaxanthin A and B, 3,6-epoxycapsanthin¹⁰.

*Capsicum annuum*L are used as carminative, an appetizer and a stomachic. Externaly, it is used as a counter irritant in the treatment of rheumatism, lumbago and neuralgia⁹. Chilli papper are used as ornamental strings and wreaths and have even been used for germicidal properties. Red chilli peppers emerged as a natural and safe alternative colouring agent, and a growing proportion of the crop is being processed for colouring agents. The colourant is

Table no.1: Percentage extractive & physical characteristic of various extracts of *Capsicum annum*L

S. No.	Extracts	%yield	Colour	Odour	Consistency
1	N-hexane	1.34% w/w	Yellowish	Characteristic	Sticky
2	Chloroform	1.36% w/w	Dark brown	Characteristic	Sticky
3	Ethanol	3.32% w/w	Reddish brown	Woody type	Sticky
4	Water	3.40% w/w	Dark brown	Characteristic	Sticky

Table no.2: Phytochemical screening of *Capsicum annum* L. root extract.

S. No.	Phytoconstituents	N-hexane	Chloroform	Ethanol	Water
1.	Alkaloids	-	+	+	+
2.	Flavonoids	-	-	-	-
3.	Glycosides	-	+	+	+
4.	Coumarin Glycoside	-	+	+	+
5.	Carbohydrates	-	+	+	+
6.	Proteins&Amino acids	-	-	-	-
7.	Tannins & Phenolic comp.	-	-	-	-
8.	Steroid	+	+	+	+
9.	Triterpenoid	+	+	+	+
10.	Saponin	-	-	-	-

Table no. 3: TLC fingerprinting profile of *Capsicum annum* L. root extract

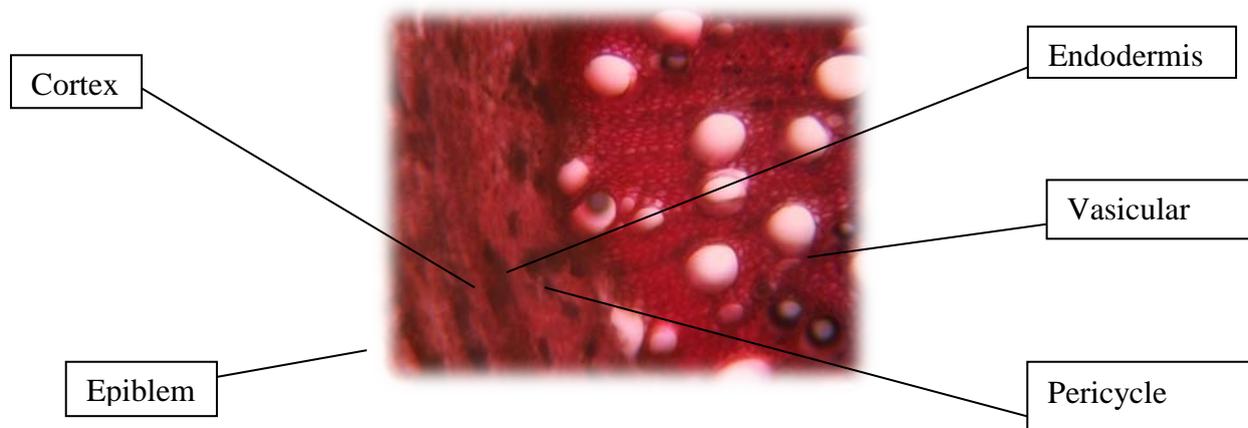
Extract	Phytoconstituent	Solvent system	Detection	After Spraying	No of spo-ts	Rf Value
Pet ether extract	Steroid	Toluene : Ethyl- acetate : Glacial acetic acid (90:10:2)	Con.H ₂ SO ₄ +va nillin	Blackish spot	7	0.52
						0.45
						0.38
						0.22
						0.11
						0.05
						0.27
Chloroform extract	Alkaloid	Toluene : Chloroform : Ethanol (28.5 : 57 : 14.5)	Iodine chamber	Brownish spot	8	0.04
						0.20
						0.39
						0.52
						0.57
						0.64
						0.73
						0.91
Ethenolic extract	Alkaloid	Ethylacetate Methanol (60:20)	Iodine chamber	Brownish spot	2	0.03
						0.07
Aqueous Extract	Alkaloid	Ethylacetate Methanol (60:20)	Iodine chamber	Brownish spot	2	0.47
						0.13

used in many products, especially salad dressings, meat

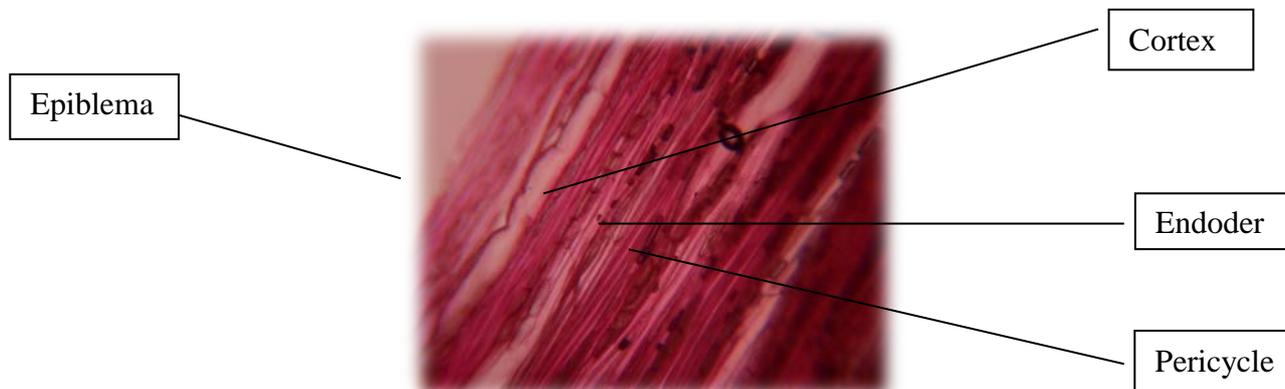
Standard methods were followed to determine the total,

Microscopical features of *Capsicum annum* L. root

Transvers section of root of *Capsicum annum*L plant (Figure no.1)



Longitudinal section of root of *Capsicum annum*L plant (Figure no.2)



products and cosmetics. Compounds produced from red peppers are also being used as a replacement preservatives for nitrites in meats. The average concentration of capsaicin is around 7000 ppm. In high concentrations, capsaicin is so powerful that it is used in tear gas sprays. Capsaicin enhances allergic contact dermatitis in the guinea pig. Chilli is reported to be used in the treatment for mental disorders¹⁰.

MATERIALS AND METHODS

Procurement of raw material: Capsicum fresh root of the plant were collected from Shahzadpur area of Ambedkar Nagar. Specimen herbarium of the plant was submitted and authenticated from N.B.R.I. Lucknow. (The accession no. for the specimen is 97848).

Standardization parameters: Capsicum roots were examined to study morphological and organoleptic characters. Sections for microscopy were prepared. The cut sections were seen under microscope after staining with Phloroglucinol and HCl. Extractive values were determined for cold and successive extraction methods.

acid-insoluble and water soluble ash values. Loss on drying, total alcoholic and total water soluble extractive value was noted.¹¹The n-hexane, chloroform, ethanol, and aqueous extract residues of roots were subjected to phytochemical screening for detection of plant constituents. TLC profiling was done as per the method described by Wagner¹². n-hexane, chloroform, ethanol and water extracts were subjected to TLC to find out the nature and approximate number of compounds present.

RESULTS

Macroscopic and organoleptic features: Physical examination of the untreated sample of Capsicum root was carried out under diffused sunlight and artificial source similar to day light. Morphological examination revealed that root are cylindrically branched having minute root hair, brownish in colour, 4.8-6.3 cm in length with rough surface, odourless, slight bitter in taste. Nodes and internodes are absent but having primary, secondary and tertiary root.

Microscopic features: A small portion of dried part of root put in hot water for 30 min, after that the T.S.and

L.S. of root with different staining supervision under microscope. There was following observation, **Cortex:** Narrow large parenchymatous zone, it is situated below the epiblema up to endodermis. **Pericycle:** It is outer layer of endodermis consists of few layer of parenchymatous cells. **Vascular bundle:** Vascular bundle is radial type, xylem is exarch, that is protoxylem is towards the periphery and metaxylem towards centre. **Epiblema:** Outermost single layer, called epiblema. (Figure no.1,2)

Physicochemical and Pharmacognostical studies: Percentage extractive value & physical characteristic of various extracts of *Capsicum annum* L. have been indicated in the Table . Cold extraction yields and Successive extraction yields higher extractive value in case of water 9.32%, 3.40% respectively on dry weight basis indicating the presence of polar compounds in root. Mean ash values (%) were found to be 9.27 (total), 0.74 (acid insoluble ash), 1.49 (water soluble ash), total alcoholic-soluble extractive value 3.54% and total water-soluble extractive value 9.32%. The higher total ash value is indicative of high contents of carbonates, phosphates, silicates, and silica. Loss on drying was found to be 8.90% on account of loss of water and volatile chemicals. Phytochemical screening was undertaken for the identification of different type of chemical constituents present in root. Screening of all extracts indicate the presence of all major phytoconstituents i.e. alkaloids, glycoside, carbohydrates, steroid and triterpenoid. (Table no.1,2)

TLC fingerprinting of root extracts of *Capsicum annum* L. were developed and represented in table no.3

The solvent system Toluene : Ethyl-acetate : Glacial acetic acid (90:10:2) was optimised and gave best resolution of spots without overlapping.

DISCUSSION

The quality of a plant product is determined by the climatic conditions of growth and root selection, use of fertilizers, harvesting, drying and storage conditions. The deviation from standard conditions lead to deterioration of products, which are then sold as adulterated products in the market. The root of *Capsicum annum* L. have been subjected to pharmacognostic standardization including phytochemical screening. The existing knowledge regarding root may be quite useful for the quality control of various formulations containing *Capsicum annum* L. root. The main highlight of the work is that it will be helpful to eliminate exhausted and inferior quality root available in local markets.

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