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Review article

MEDICINAL AND THERAPEUTIC UTILITIES OF *RAPHANUS SATIVUS*

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ABSTRACT: The radish (*Raphanus sativus*) of the Brassicaceae family domesticated in Europe during pre-Roman times is an edible root vegetable. It is grown and consumed throughout the world. Radish has numerous varieties, sizes, color and duration of cultivation time. It is annual herb, 20-100 cm long, with a rosette of lyrate, pinnatified leaves arising from a short stem. All the species of Raphanus including *R. sativus* have 2n=18 chromosome. The commercial type of radish is said to be largely self – incompatible. Radishes are an alternative treatment for a variety of ailments including whooping cough, cancer, gastric discomfort, liver problems, constipation, dyspepsia, gallbladder problems, arthritis, gallstones, kidney stones etc. The radish leaves are good source of protein, having biological value of 76.6 and digestibility co-efficient is 73.5%. Presence of some biochemical substances such as methins, sapogenins, levon; enzymes such as phosphatase, catalase; histaminergic component and a weak spasmolytic; amino acids such as lysine, methionin etc.; polyphenolics such as protocatechuic acid, vanillic acid; antibacterial substances such as Sulphoraphene and raphanin; free radical scavengers etc. and many other therapeutic and medicinal properties of radish have been discussed in the paper.
Key words: Radish, Sulphoraphene, Isothiocyanate, Free- radicals

INTRODUCTION

The ancient inhabitants of Greek prized radishes above all root crops. The root crop was a common food in Egypt long before the pyramids were built, and was popular in ancient Rome as well. The word "radish" is a derivation of the Latin word "radix," or root. Columbus and the early settlers brought radishes to America. Radish can sprout from seed to small plant in as little as 3 days [1]. The main season for sowing the radish in north Indian plains is mainly from September to March, while in the hills they are sown from March to July. This crop is harvested within 30-50 days of sowing and is pulled out from the soil when it reaches edible size.

Radish Leaves

The leaves of radish are good source of protein, if extracted commercially. They have biological value of 76.6 and digestibility co-efficient in 73.5%. In nitrogenous fraction twenty-two amino acids have been identified. An essential oil (0.002%) containing 2- hexen -1- al (leaf aldehyde) 3 – hexane -1- ol (leaf alcohol) and small quantities of n – and isobutyraldehyde and isovaleraldehyde are extracted from leaves. Some lavone compounds are also found in leaves [2]. Pharmacological basis for the gut stimulatory activity of *Raphanus sativus* leaves shows the presence of a histaminergic component plus a weak spasmolytic factor supporting its traditional use for constipation [3]. Radish leaves are rich source of calcium, iron and ascorbic acid. It serves as a very good source of calcium when consumed with rice. Phytin, found is rice helps in calcification.

Table 1: Chemical composition of *Raphanus sativus*

Nutritional value per 100 g (3.5 oz)	Radish root (white)	Radish top	Radish fruit
Edible matter %	99	-	88
Moisture %	94	90.3	90.5
Protein%	0.7	2.7	2.3
Fat%	0.1	0.6	0.3
Fibre%	0.8	0.9	1.4
Other carbohydrates	3.4	3.4	4.7
Minerals %	0.6	2.1	0.8
Calcium mg/100 g	50.0	310	80
Phosphorus mg/100g	22	60	100
Iron mg/100g	0.4	16.1	2.8
Vitamin A; I.U./100g	5.0	18,660	50
Thiamine, mg/100g	0.06	0.03	0.07
Riboflavin mg/100g	0.02	0.16	0.05
Nicotinic acid mg/100g	0.5	0.3	0.2
Vitamin C mg/100g	15.0	103	69

Medicinal and Therapeutic properties of *Raphanus sativus*

Radish Seeds

The seeds of radish contain glycosidically bound oils in which allyl, methyl and isopropyl – isothiocyanates and sulphoraphene are identified from various varieties. 4 – Methyl sulfenyl -3- butenyl cyanide, the corresponding nitrile of suplhoraphene and cleavage product of its glucosides have been also isolated. In volatile constituents of *Raphanus sativus* L. var. niger seeds, ten isothiocyanates, seven aliphatic hydrocarbons and some other volatile substances were characterized. The main isothiocyanates were hexyl isothiocyanate (18.4%), 4-methylthiobutyl isothiocyanate (17%), 4-methylpentyl isothiocyanate (8.4%), 4-methylthio-(3E)-butenyl isothiocyanate (5.2%), 4-methylthio-(3Z)-butenyl isothiocyanate (4.7%) and isoamyl isothiocyanate (2.4%) [4]. Sulphoraphene is found to be very good for antibacterial activity against *streptococcus, Pyococcus, Pneumococcus* and *Escherichia coli*. Raphanin, another sulphur containing oil from radish is very active substance against gram positive and gram negative bacteria and shows blastokolic (inhibition of seed germination) effect. The seeds of radish are also reported to possess a broad-spectrum antibiotic, named machrolysin, specific against *Mycobacterium tuberculosis.* The non-drying fatty oil obtained from radish seed is suitable for soap making, illuminating and edible purpose.

Radish Cake

Extracted seed meal yield 52.5% protein (on dry basis) and had the following amino acid composition (mg/g): lysine 300; methionin, 109; leucine, 235; valine, 293; histidine, 171; and arginine 439.

Radish root

Radish root is useful in liver and gall bladder troubles. In homoeopathy, it is used to cure headache, sleeplessness and chronic diarrhea. The typical radish odour is contributed by butyl crotonyl isothiocyanate sulfide as a chief constituent. A disagreeable odour of radish is contributed by methyl mercaptan.

The main enzymes found in radish roots are phosphatase, catalase, sucrase, amylase, alcohol dehydrogenase and pyruvic carboxylase. Radish also contains a theromostable antithiamine factor i.e. S- methyl –L- cystein sulfoxide designated as methin (M.P. 173 - 174°C). Along with this steroidal sapogenins have been also reported [5]. Radish contains glucose as the major sugar and smaller quantities of fructose and sucrose. Pectin (0.3% as calcium pectate) and pentosans are also reported while starch is absent.

Radishes are suggested as an alternative treatment for a variety of ailments including cancer, AIDS, immuno-disorders etc. Radishes possess nutraceutical properties [6]. Radish root salts contains trace elements such as aluminum, barium, lithium, manganese, silicon, titanium, fluorine and iodine (up to 18 µg/100g).

Several polyphenolics such as protocatechuic acid, vanillic acid, syringic acid and o-coumaric acid, p-coumaric, caffeic, phenyle pyruvic, gentisic and p-hydroxybenzoic acids are also reported in the roots of *R. sativus* [7]. Significant amounts of catechin (10.54 mg /g) and sinapic acid (4.83 mg/g) are found in the water extract of radish root. Its concentration was found higher than that of cauliflower and black cabbage [8]. In one of the significant finding, [9] it was observed that the catechin content of the water extract was much higher than that reported for other cruciferous plant such as *Lepidium meyenii* [10], and comparable to traditional sources such as green tea and black tea [11]. Similarly, ferulic acid content is also found to be higher than those present in alfalfa, spinach, cabbage and bitter cumin, which could make it possible to inhibit free radical-induced chain reactions and thus could contribute significantly to the antioxidant and radical scavenging activity of *R. sativus*. Effective DPPH radical, suproxide, peroxy and hydroxyl radical scavenging activity and exhibited by *R. sativus* has also been reported [12].

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