

Pakistan Journal of Pharmacology
Vol.20, No.1, January 2003, pp.9-16

PHYSICO-CHEMICAL STUDIES OF INDIGENOUS DIURETIC MEDICINAL PLANTS

**Citrullus vulgaris Schrad, Cucumis melo Linn, Cymbopogon citratus (DC)
Stapf, Moringa oleifera Lam, Raphanus sativus Linn and Zea mays Linn.**

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ABSTRACT

Six indigenous medicinal plants have been selected for the physico-chemical studies. These plants belong to Gramineae, cucurbitaceae, cruciferae and Moringaceae families. Colour, taste, pH, density, viscosity, refractive index, specific gravity and optical rotation have been studied in hot water extract of *Cymbopogon citratus* (DC) stapf where moisture, ash content, acid insoluble matter, fiber content, oil content. Iodine value and Invert sugar studies have been carried out in ethanolic extracts of *Citrullus vulgaris*, *Cucumis melo*, *Moringa oleifera*, *Raphanus sativus* and *Zea mays*. Refractive index, specific gravity, saponification value, Iodine value, unsaponifiable matter and Acid value, colour in lovibond cell have been studied in *Raphanus* seeds oil.

INTRODUCTION

Citrullus vulgaris (Schrad), water melon, (common name Tarbuz) belongs to family cucurbitaceae cultivated through out the earth. Its seeds are cooling, diuretic and strengthening (Dymock, 1890 Nadkarni, 1954, and Chopra *et al.*, 1956) aphrodisic, (Chopra *et al.*, 1956), seeds are reported also as demulcent, vermifuge and nutritive (Nadkarni, 1954,) antilithiasis (Ciulei. *et al.*, 1984). It has a vitamin C content of 2-3mg/100gm in the leaf and 108 mg/100 gms in the dry fruit. It contains hydrocyanic acid. (Watt John Mitchell *et al.*, 1962). Fruit contains carotene, lycopin, mannito, 20- 40% of oil from seeds. Seeds rich source of the enzyme urease. Juice contains citrulline to the extent of 0.17%. (Chopra *et al.*, 1956).

Cucumis melo belongs to family cucurbitaceae common name is khurbooza. Its seeds are commonly used as diuretic. These are also cooling and nutrient. The pulp of fruit is also diuretic (Nadkarni, 1954).

Useful in chronic enzyrna (Inukai *et al.*, 1966) and Kirtikar *et al.*, 1933 anthelmintic (Zinchenko *et al.*, 1955). Used in painful micturition and suppression of urine (Chopra *et al.*, 1958). In Italy the seed is used as an emollient and refreshing medicine. The seed kernel yields 40% of fixed oil. Seed contains oleic acid 29.76% and linoleic acid 59.43%. Extracts of the plant inhibit fungal activity (Watt John Mitchell *et al.*, 1962).

Cucumis melo, *cucumis sativus* (Tukhme Khiaran) and *Dolichos biflorus* (Kulthi) are very commonly used as diuretics and for removing kidney stones but no work has been done on these plants to substantiate the above property however anticalculi activity of *Dolichos biflorus* Linn has been done (Khan *et al.*, 1988).

Cymbopogon citratus (DC) Stapf (Poaceae) commonly known as "serai" lemon grass. Family Gramineae, (Maryam *et al.*, 2001 and Chopra *et al.*, 1958). Graminae, one of the largest family of the flowering plants,

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comprising of 620 genera and C. 1000 species, is widely distributed throughout the world. In Pakistan, this family is represented by 158 genera and 492 species (Cope, 1982 and Stewart (1972). Lemon grass which is a perennial grass, also possesses a C₄ photosynthetic pathway (NADP – ME type) (Hatch *et al.*, 1970).

Lemon grass is reported to have many medicinal properties. It is used as sudorific, stimulant, antiperiodic and anticatarrhal (Chopra *et al.*, 1956). A decoction made from the leaves is recommended as diaphoretic in fever (Chopra *et al.*, 1958).

An infusion of lemon grass is sometimes taken as refreshing beverage and this use gives it a local name “Hirvacha” or green tea. (Anonymous, 1950). In Java, it is used in preparation of highly spiced “sherbet” (Burkill, 1935). A number of studies are available regarding the antimicrobial activity (Ibrahim, 1992) and antimutagenic properties of the plant extract towards chemically induced mutation in *Salmonella typhimurium* strains TA 98 and TA 100 (Vinitketumnuen *et al.*, 1994)

Moringa oleifera Lam. (Syn *Moringa pterygosperma* Gaertn) known in the vernacular as Sahjna, belong to the single genus family. Moringaceae, and widely distributed in Asia, Africa and other Tropical parts of the world (Sastri, 1962 and Jahn, 1988).

It is a small to medium sized tree with multiple uses and its different parts are reported to be used in Folk medicine for the treatment of a variety of human ailments such as rheumatism, paralysis, epilepsy and ascites, almost every part of the tree is used as a vegetable (Sastri, 1962; Jahn, 1988; Dymock, 1890; Nadkarni, 1976 and Chopra *et al.*, 1956). The different parts of plant possessed antibacterial properties (Caceres *et al.*, 1991). Quisumbing (1951), give an extensive account of the manifold medicinal applications of the plant in various parts of the world.

The young fruit contains much protein, phosphorus and a fair amount of calcium and iron (Quisumbing, 1951 and Watt John Mitchell *et al.*, 1962). Fruit of *Moringa oleifera* used in disease of liver, pancreas and spleen (Chopra *et al.*, 1956 and Watt John Mitchell *et al.*, 1962), articular pains, tenanus and paralysis (Chopra *et al.*, 1956).

***Raphanus sativus* Linn:**

Raphanus sativus Linn commonly known as radish, (Mull safe) belongs to family Cruciferae and cultivated throughout subcontinent Indo Pak in gardens and plains for culinary purpose (Nadkarni, 1954). The plant is an excellent source of vitamins B & C. Particularly in India this plant is used as purgative, stimulant, antisorbetic, diuretic and lithotryptic. The seeds have been used as emmenagogue and in treatment of gonorrhoea and cancer (Watt John Mitchell *et al.*, 1962).

Root is a reputed medicine for piles, gastrodynic, pains, urinary and syphilitic complaints, relieve dysuria and strangury (Chopra *et al.*, 1958 and Nadkarni, 1954). Radish root eaten before meal improves appetite and increases the digestive power, while young radish (pods) is a diet for fistula in ano when there is no fever (Nadkarni, 1954).

Seeds of radish are expectorant, diuretic, laxative, carminative (Kirtikar *et al.*, 1933 and Chopra *et al.*, 1958).

Roots contain glycosides, enzyme and methyl mercaptan (Watt John Mitchell *et al.*, 1962). Fresh vegetable contains 91.00% moisture and seeds on extraction with petroleum ether yield 4.00% albuminoids 18.00%, soluble carbohydrates 52.66% woody fiber 9.34% and ash 16.00% (Nadkarni, 1954). Seed and root contains a fixed oil, essential oil, a sulphuretted volatile oil which resembles mustard seed oil. This oil contains sulfur and phosphoric acids (Nadkarni, 1954 and Watt John Mitchell *et al.*, 1962).

The seeds contain 30% fixed oil. The

volatile oil is a sulfur oil. The seeds also contains sulfuric acid and erucic acid (Watt John Mitchell *et al.*, 1962).

***Zea mays* Linn:**

Zea mays belong to family Gramineae. Common name is 'Bhutta'. (Chopra *et al.*, 1956). In English-Maize, Indian-Corn, it is locally called Makai (Dymock, 1890; Watt George, 1892 and Nadkarni, 1954). *Zea* consists of the fresh or dried stigmas and styles obtained from *Zea mays* L. The styles and stigmas should be collected from the unripe corn. *Zea* (corn silk) contains a volatile, alkaloid, resins, maizeric acid, fixed oil and sugar. A yellow powder of styles consists of parenchyma with two vascular bundles composed of narrow annular or spiral tracheids, epidermal cells rectangular, often extended into multicellular hairs 0.2 – 0.8 mm. in length, the basal portion consisting of two to five united cells, the upper portion usually unicellular. Purple red parenchyma cells contain a red cell sap (British Herbal Pharmacopoeia, 1983 and Nadkarni, 1954).

The silky stigmata (Corn silk) are used in decoction in diseases of the bladder and kidneys. It has marked diuretic action. It is given in lithiasis (Dymock, 1890; Kirtikar *et al.*, 1933; Martin *et al.*, 1991; Watt George, 1892; Youngken, 1948 and Watt John Mitchell *et al.*, 1962). Corn silk contains 2% of maizenic acid, a fixed oil (*Oleum maydis*), resin, sugar, mucilage, salts and phlobaphene. (Watt John Mitchell *et al.*, 1962). Corn silk (styles with stigma) is a chemical complex medicinal material having valuable properties. It has sitosterol, stigmasterol, fatty and volatile oil, saponin, a bitter glucoside substance, vitamin C, vitamin K., Corn silk is used as a choleric and diuretic agents and as an astringent (Bobryshev, 1962).

MATERIAL AND METHODS

Seeds of *Citrullus vulgaris* (Voucher No.497), seeds of *Cucumis melo* (Voucher No. 498). *Cymbopogon citratus* (DC) Stapf

leaves (Voucher No.499), Fruit of *Moringa oleifera* (Voucher No.500), *Raphanus sativus* Linn, seeds (Voucher No.501) and *Zea mays* (corn silk) (Voucher No.502); Seeds of above mention medicinal plants, *Moringa oleifera* (fruit) and *Zea mays* (Corn. silk); one kg of each, were purchased from local market and *Cymbopogon citratus* (DC) Stapf cultivated in PCSIR Laboratories complex, Karachi and identified by the Pharmacognosy Section of these Laboratories.

Physico-chemical properties of ethanol extracts of *Citrullus vulgaris* (seeds), *Cucumis melo* (seeds), *Moringa oleifera* (Fruit), *Raphanus sativus* (seeds) and *Zea mays* (Corn silk) were to determined the moisture, ash content, acid soluble, acid insoluble, fiber content, Iodine value, acid value and Invert sugar for physico-chemical analysis method followed~ by AOAC (1990), U.S.P. (1965) and B.P. (1980), Table 1. Hot water extract of the tea, *Cymbopogon citratus* (DC) Stapf (Powdered air dried leaves) was used to at 20°C, specific gravity at 20°C, and optical rotation at 20°C, followed by AOAC (1990), U.S.P. (1965) and B.P. (1980), Table 2, and oil from seeds of *Raphanus sativus* Linn was used to determined the refractive index, specific gravity, saponification value, Iodine value, unsaponifiable matter, acid value and colour in 1" lovibond cell according to the AOAC, (1990) and AOCS, (1969) and are recorded in the Table-3.

1. Preparation of ethanolic extract:

Seeds, Corn silk and fruit of above mention medicinal plants were purchased from local market and washed thoroughly with tap water and then with distilled water and dried in open air at room temperature 37 °C for 24 hours. Five Kg of each above mention, fruit and corn silk were chopped/grinded into a coarse powder to a kitchen chopper (Moulinex) and soaked 95% ethyl alcohol (3 litres) separately stirring was done by means of a mechanical stirrer (Gallen Kamp 280-010 Made in England) for one hour for one week. After one week, all parts of material filtered separately and filtrate

were evaporated reduce pressure using rotary evaporator (Büchi rota vapore El-131) at 40°C (Izhar *et al.*, 1988 and Siddiqui *et al.*, 1968). The resulting brownish yellow mass was obtained (2.50 k.g.) (2.45 k.g.) (2.65 k.g.) (2.45 k.g.).

2. Hot water extract of tea, *Cymbopogon citratus* (DC) Stapf:

Twenty gram of lemon tea was soaked in 100 ml of boiling water for 5 minutes. Then the extract was filtered (Maryam *et al.*, 2001, Shaheen Faizi *et al.*, 1998 and Azhar *et al.*, 1993) and the filtrate was used for physico-chemical properties.

3. Extraction of Oil:

The wash and dried seeds (50 gm) were

subjected to a kitchen chopper (10,000 rpm) Moulinex. [Model Depose-Brevets S.G.D.G. Pent Pending – Made in France]. Oil from the seeds powder extracted in a soxhlet extractor with pet- ether (B.P. 40-60°C) 200 ml. The solvent was removed under reduced pressure to furnish a oil was golden yellow colour (14.87gms, 29.74%) (Zahra *et al.*, 1999).

RESULTS AND DISCUSSION

The above mentioned physico-chemical studies of various indigenous diuretic plants have been examined. In the majority of the cases these evaluations have been carried out by classical techniques prior to the modern instrumental techniques. As no systematic

Table 1
Physio-Chemical Composition of Indigenous Diuretic Medicinal Plants

S. No.	Particulars	Citrullus vulgaris	Curumis melo	Moinga oleifera	Raphanus sativus	Zea mays
1	Moisture	19.21%	17.69%	2271%	2.35%	26.54%
2	Ash content	2.85%	3.00%	2.74%	2.51%	2.25%
3.	Acid soluble	2.105%	1.85%	2.05%	1.9%	1.79%
4.	Acid Insoluble	1.00%	1.05%	0.84%	0.41%	0.99%
5.	Fibre content	13.67%	11.24%	12.39%	9.19%	15%
6.	Oil content	35.2%	31.36%	7.11%	27.45%	30.61%
7.	Iodine value	179.0	181.0	141.0	210.1	135
8.	Acid value	148.0	154.5	135.0	92.5	105.4
9	Invert sugar	39.95%	34.5%	13.5%	15.25%	31.00%

Table 2
Physico-Chemical Properties of *Cymbopogon Citratus* (DC) Stapf.

Sample	Color	Taste/ Aroma	pH	Density at 29°C	Viscosit y at RD 33°C	Refracti ve index at 20°C	Specific gravity at20°C	Optical rotation at 20°C
Test tea (Lemon grass)	Olive green	Pleasant with lemon aroma	6.0	1.0115	20.2566 poises	1.4710	1.015	0.61

approach seems to have been made so far, in the present study the approach has been to study diuretic properties as a major investigation to evaluate the potential of the above selected plants. Efforts have been made to examine these species/varieties cultivated for used as vegetable and fruits as well as for extensive use in medicine, however, besides, traditional consumption as vegetables and fruits it is aimed at medicinal use also for countries like Pakistan where a cheaper source for treating or treatment is always desirable and acceptable.

Further biological and pharmacological studies of above plants are near completion and will be reported elsewhere. These physico-chemical parameters add to our basic information regarding diuretic use of the above plants as well as these studies taken as a whole will be helpful in checking further information on biological and pharmacological actions of these plants. Some other parameters have been completed; further biological and pharmacological work is still in progress/completion.

The observation made in the above study indicate that fiber, sugar and oil contents of the undertaken plants are high enough and can be added upto list of plant sources rich in

sugar, Fiber, oil contents. Further, could be used as fodder for animals also. Medicinally, their oils can be used for various ailments, thus providing cheaper sources for health and disease both which would be commercially beneficial for the country as well.

Lemon grass grows well in warm and humid climate with plenty of sun-shine and rainfall, more over high temperature and sunshine also favors the development of oil in the plant (Habib *et al.*, 1990). The common name lemon grass is due to its typical strong lemon like odour and the presence of essential oil. It has high coital content (Aldehyde) which is used as basic raw material for the synthesis of Bionones used in the manufacturing of a number of aromatic useful compounds including vitamin (Habib *et al.*, 1990). Citral is also used extensively in perfumery, soap and cosmetic (Anonymous, 1950).

The percentage of oil obtained was of the same order as reported earlier (Shafiq *et al.*, 1984). The unsaponifiable material came to be 1.24% which is the part which is responsible for growth inhibiting property due to presence of glycosides which were also identified in seedlings (Tsunao, 1982). The other physico-chemical properties of oil

Table 3
Physico-Chemical Characteristics Raphanus sativus Linn
(Muli Safed) Seed Oil

1	Yield	29.74%
2	Refractove index at 24oC	1.46969
3	Specific Gravity at 24oC	0.9058
4	Saponification value	204
5	Iodine value	104.26
6	Unsaponifiable matter	1.24%
7	Acid value	3.0
8	Colour in 1" lovibond cell	30 Y + 5R + 2B

resemble to those of seed oils of eatable cruciflies reported.

Melon seed kernels are rich in protein and fat and are used in the baking industry as a dressing for bread, cake, confectionery, sweet and snack foods. Some times, the seed kernels are even used as a substitute for almonds and pistachio and a refreshing drink is also prepared from ground melon seed kernels. Seed kernels are also considered beneficial in chronic or acute eczema and are reported to be diuretic (Anonymous, 1950). Besides these traditional uses, they can also be used as a source for edible oil (Giral, 1966) nutritional value of melon seed oil (Teotia *et al.*, 1984).

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