

## **Comparison in Various Bioactive Compounds of Leaves and Seeds of *Foeniculum Vulgare* Mill.**

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### **ABSTRACT**

Medicinal plants a gift of nature are being used against various infections and diseases in the subcontinent since past history. Herbs were use as food ( vegetables ) and flavors for hundred of years in many parts of world. Whereas number of herbs have also been traditionally regarded as natural remedies for common ailments of human population. Furthermore some herbal plants are considered as house of medicines and played an important role in nearly every culture on earth, including Asia, Africa, Europe and the Americas. A study was conducted to analyze the Leaves and seeds of *Foeniculum vulgare* for different bioactive compounds those includes saponins , total proteins, amino acids, fat and flavonoids with one and two dimensional thin layer and column chromatography followed by spectrophotometric analysis. Results indicates that leaves contained higher concentration of flavonoids and fat. Where as level of Saponins, proteins, amino acids, total minerals and other organic compounds was high in seeds. The analysis of leave and seeds of *Foeniculum vulgare* for these valuable organic compounds will provide important raw materials that can be used for preparation of medicines in Pharmaceuticals companies. Furthermore interest of people in plant made medicines are increasing due to their concern about the side effects of powerful synthetic drugs and high prices of these medicines. It is expected that raw material obtained from plants will not only reduce the prices of medicines in the pharmaceutical market but also provide rapid and reliable system of treatment of various infection and disease of human population

**Key words ;** *Foeniculum vulgare*, medicinal plants, chemical analysis.

### **INTRODUCTION**

Approximately 80% of the words population depends exclusively on plants for their health and healing. Where as in the developed world, reliance on surgery and pharmaceutical medicine is more usual but in the recent year, more and more people are complementing their treatment with natural supplements. (Dursum *et al.* 2004). Furthermore motivation of people towards herbs are increasing due to their concern about the side effects of drugs, those are prepared from synthetic materials. The people want to concern their own health rather than merely submitting themselves to impersonal health care system. Many botanicals and some common dietary supplements are good sources of antioxidants and anti-inflammatory compounds (Leung and Foster, 1996: Nadkarni, 1976)

Pakistan is rich in herbal plants wealth especially in the northern and sub mountainous areas. Almost 2,000 medicinal plant species exist in Pakistan whereas a huge number of plants need further identification on the basis of their uses. However, few of these are exploited and more than 90% of the country's requirement for medicinal herb are imported from other countries. whereas over 50% of the population in Pakistan is being treated with traditional medicines by almost 50,000 traditional local herbal practitioners and hakims (Zaidi, 998).

*Foeniculum vulgare* belongs to family Apiaceae, which is an annual, biennial or perennial aromatic herb, depending on the variety ( Farrell, 1985: Wichtl and Bisset, 1994). It is a source of Phytochemicals hormones (saponins), Proteins, amino acids, fats, flavonoids and many other organic compounds .while all of these organic compounds are important for various purposes of human population. The use of these secondary compounds of plants for the treatment of human's ailments is indeed very old ( Aritomi and Kawasaki, 1984 : Miura *et al.* 1986 ).

*Foeniculum vulgare* commonly known as fennel and develops an edible bulb contained thick base leaves, which is becoming increasing popular as a vegetable. The leaves, stalks and seeds (fruits) of the plant species are edible. It is used as carminative, digestive, lactagogue and diuretic (Matin et al, 2002). However, *Foeniculum vulgare* is an aromatic herb whose fruits are oblong, ellipsoid or cylindrical, straight or slightly curved and greenish or yellowish brown in colour. The weight of between 6 and 7 mg where as length is 6 mm and width 2mm. The dried, aromatic fruits are widely employed in culinary preparations for flavoring bread, pastry and candies. It is also use in alcohol liqueurs, as well as in cosmetic and medicinal preparations. (Bernt, 1998: Matin et al, 2002). This herb has finely out feathery foliage, umbels of mid summer flowers, curved, ribbed seeds and a thick root. It is used as an expensive and extravagant spice and vegetable in different parts of world. Its seeds contain essential oil, which is used for many purposes by human population (Tanira, 1996: Leung and Foster, 1996).The oil of *Foeniculum vulgare* regulates the peristaltic functions of the gastrointestinal tract, thereby reducing emptying time and increasing the passage of gas. It also relieves the spasm of intestines. It was experimentally observed that *Foeniculum* seeds are effective against hernias and hydrocele when used with other salts or ingredients. (Fathy et al. 2002 : Ethernton et al. 2002 ).

Therefore keeping in view the importance of *Foeniculum vulgare* the present study was undertaken with following aims and objectives.

. To analyze bioactive compounds in leave and seeds of *Foeniculum vulgare*.

To assess the *Foeniculum* leave and seeds for Saponin and Flavonoids.

To highlight effects of *Foeniculum* on health of human population.

## **MATERIALS AND METHODS**

### **Collection and Preparation of Leave and Seeds Samples**

The leave and seeds samples of *Foeniculum vulgare* were analysed for various organic compounds in this study. The leaves and seeds were collected from different hilly areas nearby Rawalpindi and Islamabad. Sixty samples of leaves and seeds were dried and crushed into powdered form. The prepared samples were stored at room temperature for further process for separation of chemical compounds.

### **Analysis of Total Protein, Amino acid and Lipids from Leaves and Seeds of *Foeniculum vulgare***

The total protein content of leaves and seeds were determine by using kjeldahal method whereas total lipid content were determined by taking ether extraction by soxhlet apparatus whereas percentage of lipid was determined by calculating initial and final weight of samples.

### **Analysis of Protein and Amino acids by Thin Layer Chromatography**

The purified samples of leaves and seeds of *Foeniculum vulgare* were subjected to one and two dimensional thin layer chromatography. Furthermore the Rf values of each amino acid was calculated and compared with standard values.

### **Analysis of Flavonoids and Saponins**

The analysis of flavonoid and saponins from leaves and seeds of *Foeniculum* were carried out in the column chromatography by using silica gel. The columns were washed with various solvents ( Diethyl ether,n-propanol,ethanol and methanol etc.) on the basis of their polarity order.( Aritomi and Kawaski,1984: Gulfraz *et al.* 2004). Furthermore 100 grams of samples has provided about 10 grams of purified (Flavonoid or Saponin ) compounds.

Furthermore all chemicals used in this study were analytical grade (Sigma and Merck ) and were imported from abroad.



***Foeniculum vulgare* in the flowering season**

## **RESULTS AND DISCUSSIONS**

The results of flavonoids, saponins, proteins, amino acids, fats etc are given in the tables 1-6. Whereas comparison of various compounds in both leaves and seeds are given in figures 1-2.

Results obtained after analysis of leaves and seeds of *Foeniculum vulgare* indicates that flavonoids , saponins,

proteins, amino acid and fats were present in these samples. The leaves contained higher concentration of flavonoids and fat. Whereas the level of saponins, protein, amino acids and other organic compounds were high in seeds. (Tables 1-6 and Figs 1-2) . The seeds of *Foeniculum* are considered as essential ingredients for many local medicines those can used against stomach, kidney and liver infection and disorders. (Etherton, 2002: Matin *et al.* 2002). The organic compounds obtained from seeds will further increase the market values of these valuable medicinal plants. The younger and fresh leaves are consider as delicious and traditional vegetables in many areas of this region (Karnick,1998) . Furthermore Seeds (fruits) are being use in all most all of houses of this region for many purposes of human population, whereas leaves are mostly used as vegetables either cooked or in the form of salad.( Zaidi,1998 )



**Figure 1.** Phytohormones (Saponin) extracted from seed of *Foeniculum Vulgare*.

**Figure 2.** Flavonoids extracted from leaf of *Foeniculum Vulgare*.

**Figure 3.** Proteins extracted from seeds of *Foeniculum Vulgare*.

**Table 1.** The Percentage (%) of different chemical compounds in leave and seeds of *Foeniculum Vulgare*.

<u>Chemical compounds</u>	seeds	Leave
Dry matter	81.10	75.6
Total protein	24.12	18.5
Total fat	20.90	25.6
Total fiber	9.50	11.5
Total mineral	9.50	12.5
Moisture	8.90	20.5

**Table 2 .** The Percentage (%) of Saponins in leave and seeds of *Foeniculum Vulgare*.

Sample	seeds	Leave

1	31.10	25.1
2	33.12	15.5
3	30.10	25.4
4	29.50	11.9
5	19.20	12.5
6	38.16	20.6

**Table 3.** The Percentage (%) of Flovonoids in leave and seeds of *Foeniculum Vulgare*.

Sample	seeds	Leave
1	26.17	46.14
2	17.10	37.19
3	14.16	34.16
4	9.20	39.20
5	11..25	29.25
6	8.16	38.17

**Table 4.** The Percentage of Amino acids in leave and seeds of *Foeniculum Vulgare*.

Amino acids	Rf Values of	
	Seeds	Leave
Glycine	0.45	0.48
Lecuine	0.65	0.58
Isoleucine	0.78	0.75
Proline	0.57	0.51
Phenylanine	0.47	0.49
Tryptophane	0.58	0.52

**Table 5.** Spectrophotometric analysis ( 470 nm) of leave of *Foeniculum Vulgar* after extraction of various compounds with different solvents.

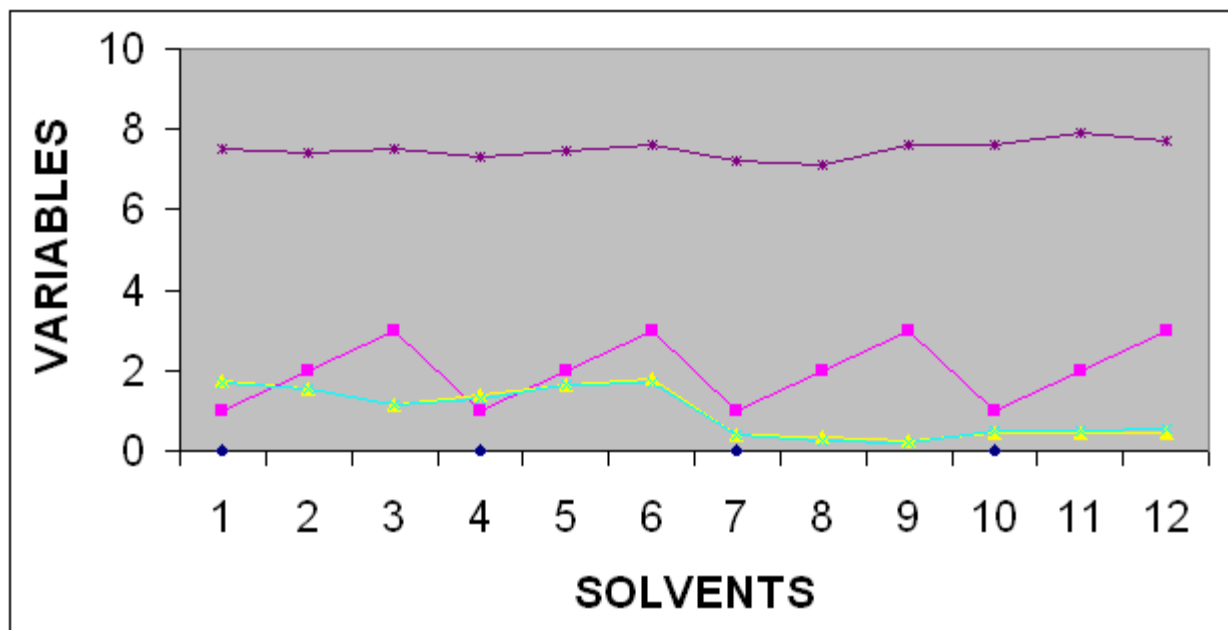
Solvents	Compounds	Concentration	Absorbance at470nm	PH
Diethyl ether	1	1.718	1.704	7.5
	2	1.556	1.566	7.4
	3	1.136	1.136	7.5
n-Propanol	1	1.398	1.308	7.3
	2	1.657	1.655	7.45
	3	1.771	1.701	7.6
Ethanol	1	0.413	0.388	7.2

	2	0.351	0.272	7.1
Methanol	1	0.428	0.511	7.6
	2	0.461	0.513	7.9
	3	0.431	0.524	7.7

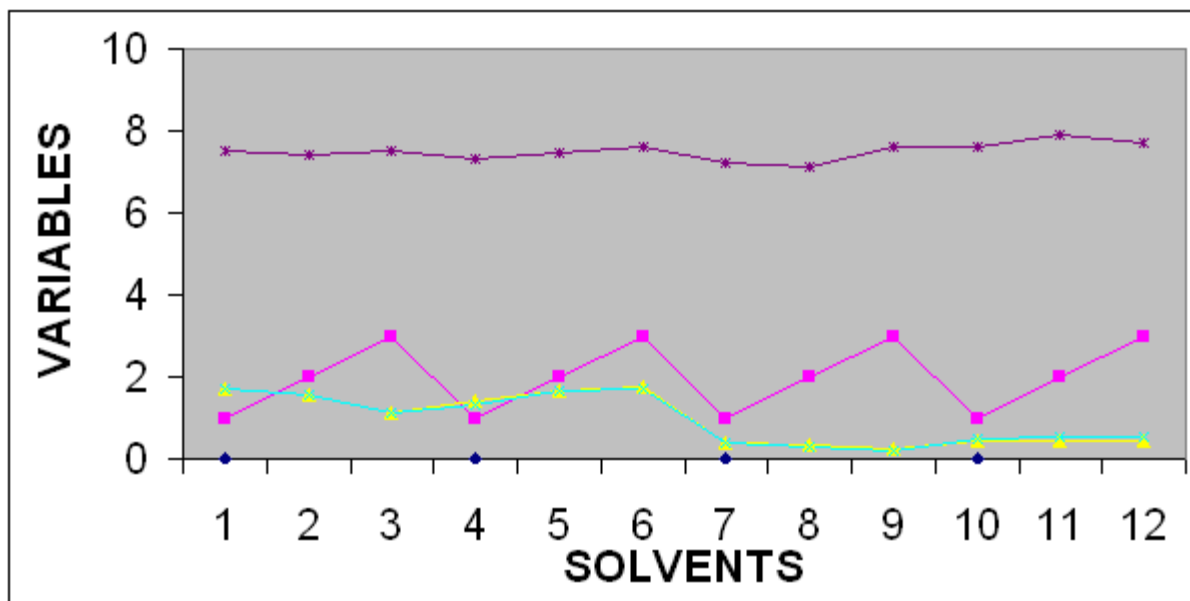
**Table 6.** Spectrophotometric analysis ( at 470 nm) of seeds of *Foeniculum Vulgare* after extraction of various compounds with different solvents.

Solvents	Compounds	Concentration	Absorbance at470nm	PH
Diethyl ether	1	1.718	1.704	7.5
	2	1.556	1.566	7.4
	3	1.136	1.136	7.5
n-Propanol	1	1.398	1.308	7.3
	2	1.657	1.655	7.45
	3	1.771	1.701	7.6
Ethanol	1	0.413	0.388	7.2
	2	0.351	0.272	7.1
	3	0.228	0.211	7.6
Methanol	1	0.428	0.511	7.6
	2	0.461	0.513	7.9
	3	0.431	0.524	7.7

**Figure 1:- Comparison in concentration, absorbance and pH values of saponins analyzed from Seeds of *Foeniculum vulgare* with different solvents.**



**Figure 2:- Comparison in concentration, absorbance and pH values of Flavonoids analyzed from leaves of *Foeniculum vulgare* with different solvents.**



## REFERENCES

- Aritomi, M and T. Kawaskaki, 1984. Three highly oxygenated Flanone Glucuronides in Leaves of *Spinacia Oleracea*. *Phytochemist*.23, 2043-47.
- Bernth, J. 1998.. Biological and structural regularities of essential oil accumulation in developing fruits of *Foeniculum vulgare* Mill) , *Med. Pl.prod. Budapest, UHFI*.
- Dursum, E, S. Otles and E. Akcicek. 2004. Herds as Food source in Turkey . *Asian Pacific J. Cancer Prev* 5. 334-339.
- Etherton, P. H, K. Hecker and A. Bonomone. 2002. Bioactive compounds in foods: Their role in Prevention of cardiovascular disease and cancer. *Am. J. Med.* 113, 71-88.
- Karnick, C.H. 1994. Pharma copocial standards of Herbal plants,Sri, Satg.Pub,(1-2) 139-141.
- Farrell, K. T. 1988. Spices, Condiments and Seasonings. AVI Publ. Westport, CT. pp 106-109.
- Fathy, M., S. Afaf. H. Shehata, A. E. Kaleel and S. M. Ezzhat. 2002. An acylated Kaempferal Glycoosider from Flovones of *Foeniculum vulgare* and *F. Dulce*. *Moecules*, 7, 245-251.
- Gulfraz, M., M. Arshad,k N. Nayyar, N. Kanwalj and U. Naisr.2004. Investigation of Bio active compounds of *Berberis lyceum* Royal and *Justicia Adhatoda* L. *Ethanbotanical. Leaflet. world wide web*, 1-10.
- Leung, A.Y and S. Foster. 1996. *Encyclopedia of common Natural Ingredients used in food, Drugs, and*

cosmetics, (ed) Rube. John Wiley, New York.

- Matin, A., M. Khan, A. Ashraf and R.A. Qureshi. 2002. Traditional use of shrubs and trees of Himalayan Region, Shogran Valley, District Mansehra (Hazara), Pakistan. *Humdard Medicus*. XLV(2):51.
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- Miura, Y., K. Ogawa, H. Fukui and M. Tabata. 1986. Changes in the essential oil components during the development of Fennel plants from somatic Embryos. *Plant Med.* 52, 96-5.
- Nad Karni, K. M 1976. *Indian Materia Medica Bombay* : Popular parkas ham 557-559.
- 
- Simon, J.E and A. Quinn 1988. Characterization of essential oil of parsley. *J. Agr, Food chem.* 36 : 467-472.
- 
- Tanira, M.O.M, 1996. Pharmacological and toxicological investigation on *Foeniculum vulgare* dried fruit extract in experimental animals. *Phytother Res* 10:33-36.
- 
- Wichtl, M and N.G. Bisset 1994. *Herbal drugs and phytopharmaceuticals* (ed), Med. Pharm scientific Publ Stuttgart, pp 107-8.
- Zaidi, S. H. 1998. Existing indigenous medicinal plant resources of Pakistan and their prospects for utilization. *J. Pakistan Forest.* 48(2):5-9.
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