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**INDO AMERICAN JOURNAL OF
PHARMACEUTICAL SCIENCES**Available online at: <http://www.iajps.com>**Research Article****ESTIMATION OF CRUDE FIBRE CONTENT IN SPICES AND
FRUITS****Gogakar Yadilal, Manda Manisha, Eda Pavani, Malladi Navya,
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Abstract:

Crude fiber consists largely of cellulose (60-80%) and lignin (4-6%) plus some mineral matter. These Fibers are beneficial in treating or preventing constipation, hemorrhoids, diverticulosis, coronary heart diseases, and some type of cancer. A rapid method was developed for the quantitative estimation of crude fiber present in different natural food stuff by using Hennerberg, Stohmann and Rauterberg method. The following fruits Citrus Sinensis, Vitis Vinifera, Beta Vulgaris, Ziziphus Jujube, Musa Balbisiana and Malus Domestica show the ascending order of crude fiber percentage. The following spices Elettaria Cardamomum, Foeniculum Vulgare, Illicium Verum, Syzgium Aromaticum, Cuminum Cyminum and Cinnamomum Verum shows descending order.

Key words: Crude fiber, Fruits, Spices, Hennerberg, Stohmann and Rauterberg method

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INTRODUCTION: [1]

Over the last decade, significant developments have been made in our understanding of crude fiber and its role in the promotion of health and disease risk reduction. A wealth of scientific evidence demonstrates that adequate dietary fiber intake has a number of health benefits, including maintenance of healthy laxation and the reduced risk of cardiovascular disease and cancer. The 2005 *Dietary Guidelines for Americans* recommendation to “choose fiber-rich fruits, vegetables, and whole grains often” is based on this evidence[2]. Other potential health benefits being investigated include fiber’s role in maintaining a healthy weight[3,4,5], gastrointestinal health[6,7,8], and in treating or preventing constipation[9,10], hemorrhoids[11,12], coronary heart diseases[13,14,15], and some type of cancer[16,17,18], and glucose modulation[19,20,21].

Crude fiber recommendations and Intake [22]

In 2002, the Institute of Medicine (IOM) established an Adequate Intake (AI) level for fiber as part of the Dietary Reference Intake (DRIs) for macronutrients. The IOM recommends that people of all ages consume 14 grams of fiber for each 1,000 calories. Please see Table 1 for recommendations by age and sex.

Table 1: Fiber Recommendations by Age and Sex
[2]

Population	Daily Fiber Recommendation
Children ages 1-3 years old	19 grams
Children ages 4-8 years old	25 grams
Young boys ages 9-13 years old	31 grams
Young girls ages 9-13 years old	26 grams
Teenage boys ages 14-18 years old	38 grams
Teenage girls ages 14-18 years old	26 grams
Young and adult men ages 14-50 years old	38 grams
Young and adult women ages 19-50 years old	25 grams
Men ages 50 years and older	30 grams
Women ages 50 years and older	21 grams

EXPERIMENTAL PROCEDURE FOR CRUDE FIBRE ESTIMATION:[23,24]**Materials and Chemicals Required:**

Sulphuric acid solution (H₂SO₄), Sodium hydroxide solution (NaOH), Petroleum ether, Distilled water and Alcohol(ethanol).

Preparation of solutions:

Sulphuric acid solution (0.255 ±0.005N) :

1.25g concentrated sulphuric acid diluted to 100mL (concentration must be checked by titration).

Sodium hydroxide solution (0.313 ±0.005N) :

1.25g sodium hydroxide in 100mL distilled water (concentration must be checked by titration with standard acid)

Essential Instruments:

1. Digestion Apparatus: A multi-unit assembly with rheostat- controlled electric heaters, and condensers to fit 600 mL beakers, designed specifically for crude fiber determinations, is recommended. Heaters must be adjustable to the temperature that will bring 200 mL of water at 25 °C to a rolling boil in 15 ± 2 minutes (Note 1).

2. Filtering Device: A California Modified Buchner Funnel, two-piece polyethylene, with a 200 mesh stainless steel screen, is recommended.

3. Muffle Furnace: Equipped with a pyrometer and capable of operating at temperatures up to 600 °C.

4. Drying Oven: Forced draft or convection air oven, operating at 130 ± 2 °C

Glassware: Test tubes, conical flask, pipettes, beakers, stirrer, measuring cylinder, funnel, centrifuge tubes etc.

Miscellaneous: Test tube stand, test tube holders, filter paper, butter paper, spatula, thermometers, stands, tissue paper, zip pouches, markers, gloves, labels, cotton swabs, disinfectant etc.

Methods:**Experimental Procedure for Crude Fiber Estimation:****Collection and authentication of plant material:**

The plant materials of fruits and spices was collected in the month of october 2017 from a local market. The plant material was taxonomically identified by **Dr. S.K Mahmood**, Department of Botany, Nijam University- Hyderabad.

Sample preparation:

The plant materials were powdered with a mechanical grinder to form a coarse powder. The powder was passed through sieve no 10 and was stored in an air tight container until further use. The powder was used for the extraction process.

Procedure:

1. Extract 5g of ground material with ether or petroleum ether to remove fat (Initial boiling temperature 35 -38°C and final temperature 52°C). if fat content is below 1%, extraction may be omitted.

2. After extraction with ether boil 2.5g of dried material with 200mL of sulphuric acid for 30min with bumping chips.
3. Filter through muslin and wash with boiling water until washing are no longer acidic.
4. Boil with 200mL of sodium hydroxide solution for 30min.
5. Filter through muslin cloth again and wash with 25mL of boiling 1.25% H₂SO₄, three 50 ml portions of water and 25mL alcohol.
6. Remove the residue and transfer to ashing dish (preweighed dish W₁).
7. Dry the residue for 2h at 130 ±2°C. Cool the dish in a desiccator and weigh (W₂).
8. Ignite for 30min at 600 ±15°C.
9. Cool in a desiccator and reweigh (W₃).

Calculation:

$$\% \text{ crude fiber in ground sample} = \frac{\text{Loss in weight on ignition } (W_2 - W_1) - (W_3 - W_1)}{\text{Weight of the sample}} \times 100$$

Where

W₁ = weights of residue before drying,W₂ = weight of residue after drying for 2hrs at 130 ±2°C,W₃ = weight of residue after ignite for 30min at 600 ±15°C.**RESULTS:****Table 2: Estimation of Crude Fiber in Fruits**

S.NO	PLANT MATERIALS	WEIGHT TAKEN (in gms)	W ₁ (in gms)	W ₂ (in gms)	W ₃ (in gms)	CRUDE FIBER %
1	Musa balbisiana	5.65	3.5	2.16	1.01	20.3
2	Vitis vinifera	5.25	0.65	0.04	0.002	0.91
3	Beta vulgaris	5.28	1.29	0.21	0.013	3.59
4	Malus domestica	5.84	3.72	2.56	0.136	41.4
5	Citrus sinensis	5.65	0.45	0.04	0.018	0.35
6	Ziziphus jujube	5.14	3.36	0.9	0.216	13.2

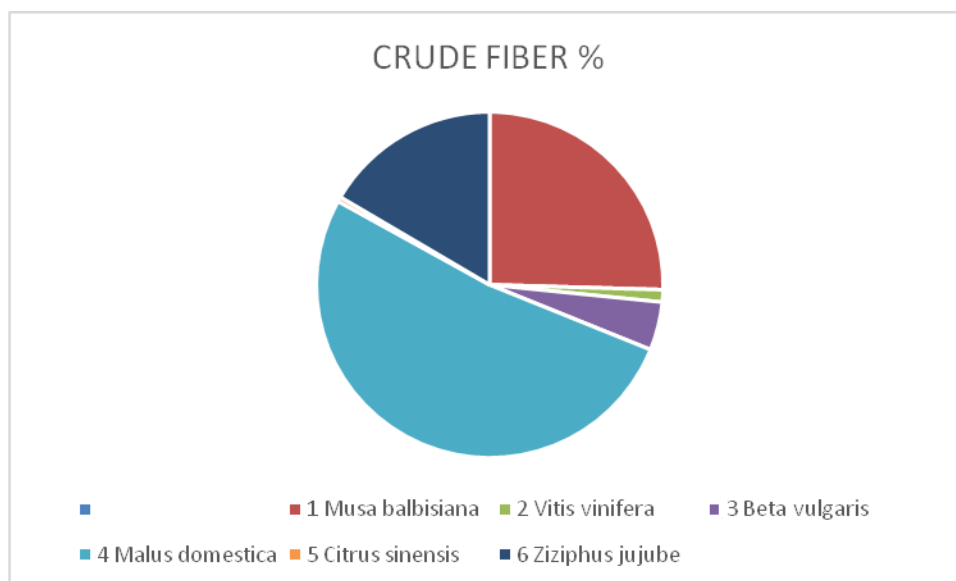
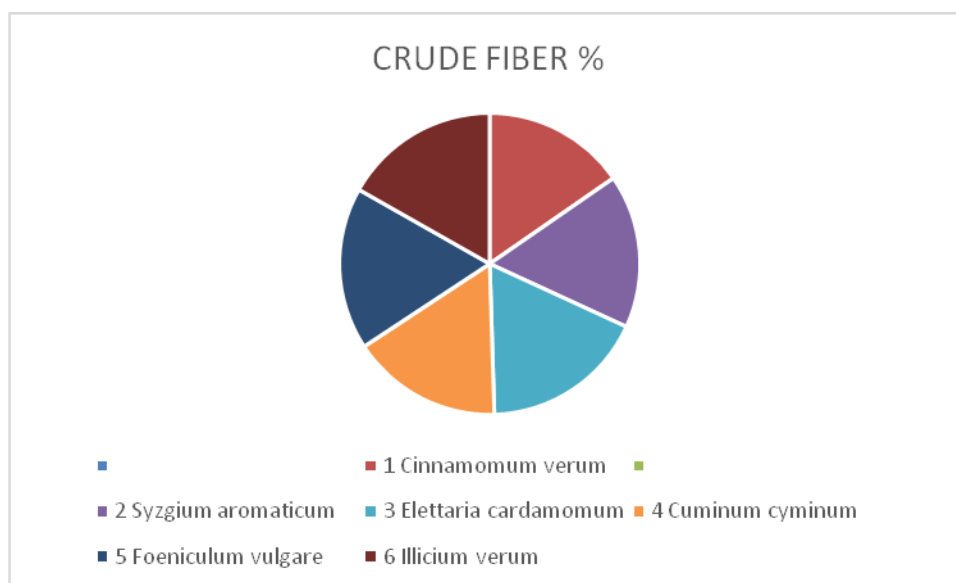


Table 3: Estimation of crude fiber in spices:

S.N O	PLANT MATERIALS	WEIGHT TAKEN (in gms)	W ₁ (in gms)	W ₂ (in gms)	W ₃ (in gms)	CRUDE FIBER %
1	Cinnamomum verum	5.017	12.5	3.55	0.57	60.58
2	Syzgium aromaticum	5.023	11.7	3.683	0.424	64.88
3	Elettaria cardamomum	5.074	16.6	5.154	1.625	69.55
4	Cuminum cyminum	5.035	13.41	3.491	0.269	63.96
5	Foeniculum vulgare	5.0162	15.3	5.04	1.294	68.67
6	Illicium verum	5.059	11	4.96	1.16	66.2

**DISCUSSION AND CONCLUSION:**

In the extraction of crude fiber from any plant material, a series of processes must be carried out to get the cellulose remains. These processes include treatment of the plant material with sulphuric acid, sodium hydroxide and petroleum or ether if necessary. The use of sulphuric acid and sodium hydroxide are for acid and alkali digestion and the petroleum and ether, antifoaming agents. The end result after the extraction process yields a mixture of cellulose, hemicelluloses and lignin. As mentioned above, cellulose is the major component in crude fiber because it cannot be digested. Hemicelluloses and lignin however can be digested to certain extents. Hemicellulose consists of sugar monomers which can be easily hydrolyzed and lignin has hydrophilic properties. These properties largely explain why they are in so little amount in crude fiber.

During the acid and subsequent alkali treatment, oxidative hydrolytic degradation of the native

cellulose and considerable degradation of lignin occur. The residue obtained after final filtration is weighed, incinerated, cooled and weighed again. The loss in weight gives the crude fiber content. The method is applicable to corn and other grains, feedstuffs containing vegetable materials, flours and meals.

Crude fiber refers to the residue of a feed that is insoluble after successive, boiling with dilute acid and alkali. This method was originally proposed at the weende experiment station. Hence this method on determination of crude fiber is known as Weende's method of determination of crude fiber.

Crude fiber is the portion of the total carbohydrate of a food that is resistant to the acid and alkali treatment. The Weende scheme of proximate analysis is to separate the total carbohydrate into two categories viz. crude fiber and Nitrogen free extractives. Nitrogen free extractive represents the soluble sugar starches, glycogen, some fraction of

hemicellulose and of course other water soluble components like water soluble vitamins etc.

As per Weende method, crude fiber is the fraction of carbohydrate that remains after treatment with acid and alkali. Effect of acid and alkali treatment on a fat free food.

The following fruit *Citrus Sinensis*, *Vitis Vinifera*, *Beta Vulgaris*, *Ziziphus Jujube*, *Musa Balbisiana* and *Malus Domestica* shows the ascending order of crude fiber percentage. The following spices *Elettaria Cardamomum*, *Foeniculum Vulgare*, *Illicium Verum*, *Syzgium Aromaticum*, *Cuminum Cyminum* and *Cinnamomum Verum* shows descending order.

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