

# Studies on *Bryophyllum pinnatum* leaves powder and its fortification in snack product

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■ **ABSTRACT** : The *Bryophyllum pinnatum* is a medicinal plant. The family of *Bryophyllum pinnatum* is *Crassulaceae*. The native place of *Bryophyllum Pinnatum* is Madagascar. In *Bryophyllum pinnatum*, number of bioactive component is present such as alkaloids, triterpenes, lipids, flavonoids, glycosides, bufadienolides, saponin, phenols, and organic acid. *Bryophyllum pinnatum* is a medicinal plant and used as a treat the number of diseases like anthelmintic, wound healing, antioxidant activity and anti-inflammatory, etc. Mostly *Bryophyllum pinnatum* leaves used to treat Urinary Tract Infection. This research studied on the nutritional composition of the *Bryophyllum pinnatum* leaves powder after drying and its fortification into snack product. *Bryophyllum pinnatum* leaves is a good source of human nutrition and good dietary supplements. There are number of alternative drying methods will be used for the drying of the *Bryophyllum pinnatum* leaves instead of shade drying method. Alternative methods of drying are Microwave drying and tray drying. Tray drying will be carried out at different temperature at 40°C, 50°C, 60°C, 70°C and 80°C for specific time period 17hrs, 15hrs, 10hrs, 7hrs and 5hrs while microwave drying will be carried out at 70W, 140W, 210W and 280W. The *Bryophyllum pinnatum* leaves powder is fortified into the different food product like, bakery, confectionary, extruded products, snack product, etc. This food product shows nutritional as well as medicinal values it is called as nutraceutical food. The main objective of this research is drying study on leaves, nutritional composition and its fortification in snack product. For the preparation of *Bryophyllum pinnatum* leaves powder papdi 70°C temperature of tray drying is used on the basis of nutritional composition of tray drying leaves powder.

■ **KEY WORDS** : *Bryophyllum* leaves, Medicinal value, Nutritional composition, Drying methods, Nutritional composition

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**B***ryophyllum pinnatum* is a medicinal plant, largely used in folk medicine. It belongs to the family *Crassulaceae* and botanical name is *Bryophyllum pinnatum*. *Bryophyllum pinnatum* is commonly known as air plant, miracle leaf, life plant, zakham-e-hyat, panfiti, love plant, patharjatta and

ghayamari. *Bryophyllum pinnatum* has been accepted as a herbal remedy in mostly all parts of the world (Olajide *et al.*, 1998). The origin of *Bryophyllum pinnatum* is Madagascar. *Bryophyllum pinnatum* grows widely and used as folk medicine in tropical Africa, India, China, Australia and tropical America, Madagascar, Asia and

Hawaii (Yadav and Dixit, 2003). *Bryophyllum pinnatum* is an erect, succulent, perennial shrub that grows about 1.5 m height with opposite, glabrous leaves (3-5 deeply crenulated, fleshy leaflets) and it reproduces vegetatively from leaf bubsils (Agoha, 1974). *Bryophyllum pinnatum* is astringent, sour in taste, sweet in the post digestive effect and has hot potency (Kanika, 2011). *Bryophyllum pinnatum* contains number of active compound groups such as, alkaloids, triterpenes, lipids, flavonoids, phenols, carotenoids, tocopherol, quinine, glycosides, bufadienolides, saponin and coumarins (Adenike *et al.*, 2008). It is used traditional medicine for the treatment of different diseases like anthelmintic, immunosuppressive, Hepatoprotective, anticonvulsant, Neuropharmacological and antipyretic (Kamboj and Saluja, 2009). The plant shows Hepatoprotective activity and is also used to increase vascular integrity, to treat hypertension and kidney stones. In India mostly *Bryophyllum pinnatum* leaves used to treat urinary stone (kidney stone) (Vaidya, 2010). *Bryophyllum pinnatum* is used traditional treatment of earache, burns, abscess, ulcer, insect bites, diarrhea and lithiasis (Halliwell and Gutteridge, 1997).

The different methods of drying are used for the preparation of *Bryophyllum pinnatum* leaves powder. These drying methods are sun drying, tray drying, microwave drying, and other drying methods. Drying of *Bryophyllum pinnatum* leaves is carried at different temperature for specific time period. Time required for sun drying is 2-3 weeks. In this research comparative study is carried out between tray drying and microwave drying method of *Bryophyllum pinnatum*. Tray drying required more time than microwave drying (Yongasawatdigul and Gunasekaran, 1996). The *Bryophyllum pinnatum* leaves is dried by using tray drying method and microwave drying method. The temperature of tray drying is 400 C, 500 C, 600 C, 700 C and 800 C for 17 hrs, 15 hrs, 10 hrs, 7 hrs and 5 hrs, respectively and for microwave drying required 210 min, 150 min, 105 min and 60 min at 70W, 140W, 210W and 280W, respectively.

After the drying of leaves are grinded by grinder. *Bryophyllum pinnatum* leaves shows medicinal as well as nutritional properties. The objective of this review is the, to develop the nutraceutical food product and to study the drying method and its nutritional composition of *Bryophyllum pinnatum* leaves powder and also studied

on physico-chemical analysis of fortified snack product papdi. Snack foods are an integral part of diet and have been, over a period of time, commercially exploited on a wide scale (Senthil *et al.*, 2001). The snack products are categorized under potato as well as banana chips, namkeen, fun foods and other Indian traditional fried snacks such as murukku, kodubale, puri, shankarpali and papdi which is prepared by blends of flour and other ingredients (Babu *et al.*, 2013). *Bryophyllum pinnatum* leaves powder is fortified into the snack product papdi which shows medicinal as well as nutritional composition. This research is studied on the physicochemical analysis of *Bryophyllum pinnatum* leaves powder papdi.

Name of Nutrient	Values (%)
Carbohydrate	72.92 ± 1.08
Protein	5.38 ± 0.10
FAT	1.28 ± 0.07
Potassium	3.49 ± 0.01
Calcium	4.99 ± 0.01
Crude fibre	6.02 ± 1.06
Ash content	1.21 ± 0.07

### Nutritional composition of *Bryophyllum pinnatum* leaves :

*Health benefits :*

Antimicrobial activity :

5 methyl 4,5,7 trihydroxyl flavones and 4,3,5,7 tetrahydroxyb 5 methyl 5 propenamine anthocyanidines shows antimicrobial activities against *Pseudomonas eruginosa*, *E. coli*, staphylococcus aureus, *Klebsiella pneumonia*, *Candida albicans* and *Aspergillus niger* (Okwu and Nnamdi, 2011). Typhoid fever and bacterial infection is treated by 60 % methanolic extract from *Bryophyllum pinnatum* leaf. Bryophyllin A and bryophyllin C shows strong insecticidal properties (Veitch and Grayer, 2007).

Immunomodulatory effect :

The liquid of leaves causes inhibition of cell-mediated and humoral immune responses in mice. Leaf extracts inhibited *in vitro* lymphocyte proliferation and showed *in vivo* immunosuppressive activity, it have been proved that the aqueous extract of leaves possesses immunosuppressive activity (Rossi-Bergmann *et al.*,

1994). Fatty acid present in *Bryophyllum pinnatum* is responsible for its immunosuppressive effect *in vivo* as from the ethanolic extract a purified fraction (KP12SA) of *Bryophyllum pinnatum* found 20- fold more potent to block murine lymphocyte proliferation than the crude extract (Almeida *et al.*, 2000).

**Neproprotective activity :**

The aqueous extract of the leaves of *Bryophyllum pinnatum* possess potent neproprotective activity in Gentamycin- induced nephrotoxicity in rats [27]. The plant extract was found to exert less diuretic and antiurolithic activity (Harlalka *et al.*, 2007).

**Antihypertensive :**

The study shown the presence of Anti-hypertensive activity of *Bryophyllum pinnatum* aqueous and methanolic leaf extracts on arterial blood pressure and heart rates of normotensive and spontaneously hypertensive rats. The Methanolic extract of leaf decrease in arterial blood pressure and heart rates (John Ojewole, 2002).

**Wound healing activity :**

The ethanolic extract of leaves of the plant is used for its wound healing activity by using excision wound model in rats. Steroid glycosides present in *Bryophyllum pinnatum* leaves shows wound healing activity (Prasad *et al.*, 2012).

**Anticancer property :**

Ethanolic extract of *Bryophyllum pinnatum* leaves has ant cancerous activity. Bufadienolides present in *Bryophyllum pinnatum* leaves shows strong cancer chemopreventive agents. Five bufadienolides isolated from the leaves of the plant is inhibitory effect on Epstein-Bar virus early antigen (EBV- EA) activation in Raji cells decrease by the tumour promoter, 12-Otetradecanoylphorbol- 13- acetate. All bufadienolides show inhibitory activity. Bryophyllin A shows highest activity (Veitch and Grayer, 2007).

Following are objectives of this research topic “studies on *Bryophyllum pinnatum* leaves powder and its fortification in snack product” are

- Optimization of drying method of *Bryophyllum pinnatum* leaves.
- To study the physico-chemical properties of

*Bryophyllum pinnatum* leaves powder.

- Optimization of process and it’s fortified with dried leaves powder into snack product.

## ■ METHODOLOGY

### Collection of raw material:

*Bryophyllum pinnatum* leaves are collected from the local area and plant nursery in Aurangabad and Vasant Rao Naik Marathwada University, parbhani. The freshly harvested leaves are washed with tap water to remove any pesticides or foreign matter on leaves and then they are sorted and kept for different drying process.

### Equipment’s and instrument:

The different equipment’s required for the project were made available from the Agricultural Process Engineering Lab, Soil and Water Testing Lab, Department of Agricultural Engineering, Maharashtra Institute of Technology, Aurangabad.

### Methods :

#### Preparation of *Bryophyllum pinnatum* leaves for drying:

**Sorting :** The fresh leaves were collected from the local area and plant nursery in Aurangabad and Vasant Rao Naik Marathwada University, Parbhani. The stems and unwanted parts of *Bryophyllum pinnatum* leaves were removed.

**Washing :** The leaves are washed with tap water to remove from dirt and dust particle. Washing was again repeated five times by using distilled water. The excess water was removed from the leaves. After the complete removal of water the leaves were kept in thin layer in tray drying and microwave drying process. The various types of drying were used in this study like tray drying and microwave drying process.

**Grinding :** The dried leaves was crushed in mechanical grinder to make fine powder which was stored at room temperature for further use.

#### Methods for drying :

For the drying of *Bryophyllum pinnatum* leaves tray drying and microwave drying method was used. The weighed the sample 50g accurately.

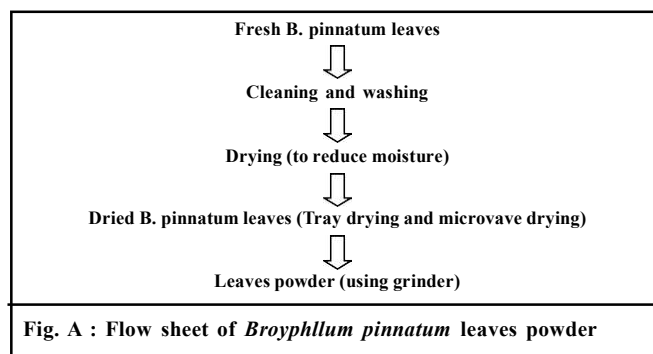
#### Tray drying :

Weighed the sample 50g accurately and wash the

*Bryophyllum pinnatum* leaves with distilled water. Remove all the water and spread thin layer on the tray and placed into the cabinet tray dryer at different temperatures like 400C, 500C, 600C, 700C and 800C for 17hrs, 15hrs, 10hrs, 7hrs and 5hrs, respectively. In cabinet tray method, retention of nutrient values was more as compare to the other drying method.

### Microwave drying :

Weighed the sample 50g accurately and pretreatment of *Bryophyllum pinnatum* leaves was carried out. The *Bryophyllum pinnatum* leaves spread on the glass plate and placed into microwave oven. The different watt was used for drying of *Bryophyllum pinnatum* leaves are 70W, 140W, 210W and 280W for the 210min, 150min, 105min and 60min, respectively.



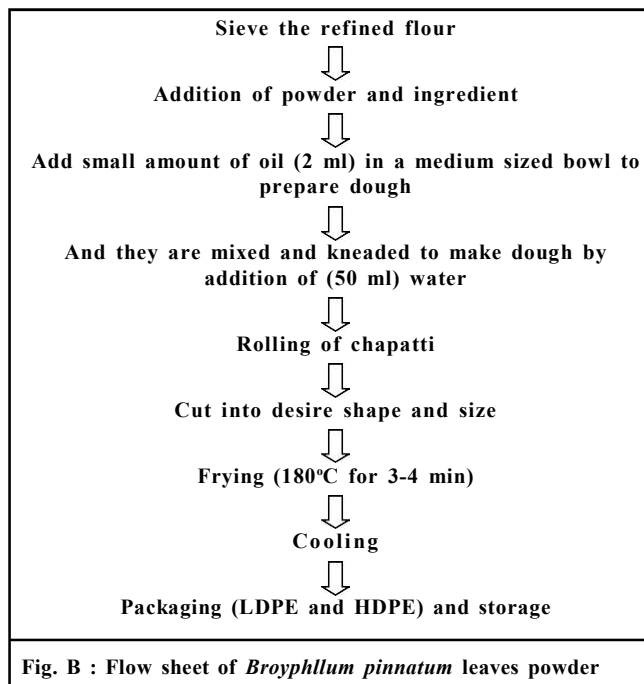
Ingredients	Quantity
Refined wheat flour	100g
Cumin seed	1.5g
Ajwain	1 g
Chili powder	2 g
Turmeric powder	1 g
Salt	1.5 g
Water	50 ml

Addition of *Bryophyllum pinnatum* leaves powder 3 g, 6g and 9g in papdi.

### Processing flow sheet for preparation of *Bryophyllum pinnatum* leaves powder papdi :

For the preparation of papdi 700C temperature of tray drying was used on the basis of chemical composition of leaves powder. The nutritional composition of 700C is

more than other temperatures used in tray drying method and microwave drying method of *Bryophyllum pinnatum* leaves. Flow sheet of *Bryophyllum pinnatum* leaves powder papdi.



## RESULTS AND DISCUSSION

The results obtained in the present investigation entitled “studies on *Bryophyllum pinnatum* leaves powder and its fortification in snack product” are summarized herewith and discussed for their significance. In the present investigation, attempts have been made to standardize technology for processing of papdi. The product was evaluated for their physico-chemical and sensory qualities using semi trained panel members.

### Drying methods of *Bryophyllum pinnatum* leaves :

There are two drying methods are used for drying of *Bryophyllum pinnatum* leaves. The comparative study of both methods, these methods are Tray drying method and Microwave drying at different time and temperature.

### Tray drying :

The moisture loss data obtained at different temperature ranges has been shown in following Fig. 1.

Fig. 1 shows the rate of removal of the moisture at

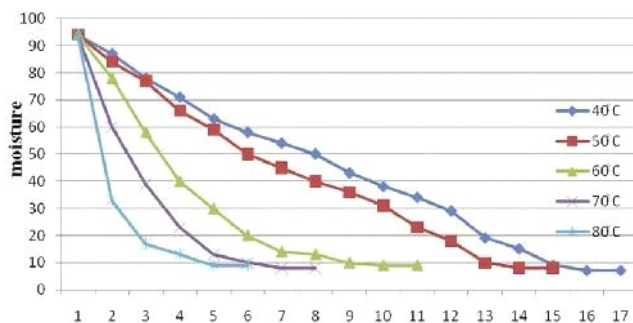


Fig. 1 : Rate of moisture per cent at tray drying

different temperature ranges *i.e.* 400C, 500C, 600C, 700C and 800C. Above drying curve indicates that there is slower rate of moisture removal at 400C. It takes 17hrs for the removal of moisture upto equilibrium, whereas 15hrs required at 500C to reach the moisture content at equilibrium, whereas 10hrs required at 600C, and 700C required 7hrs to reach the moisture content at equilibrium.

**Microwave drying :**

The moisture loss data obtained at different Watt ranges has been shown in following Fig. 2.

Fig. 2 shows the rate of removal of the moisture at different temperature ranges *i.e.* 70W, 140W, 210W and 280W. Above drying curve indicates that there is slower rate of moisture removal at 70W. It takes 210 min for the removal of moisture upto equilibrium, whereas 165min required at 140W to reach the moisture content at equilibrium, whereas 120min required at 210W and 280W required 75min to reach the moisture content at equilibrium. On the other hand moisture removal was faster at 280W which taken only 75min to reach the moisture level at an equilibrium point.

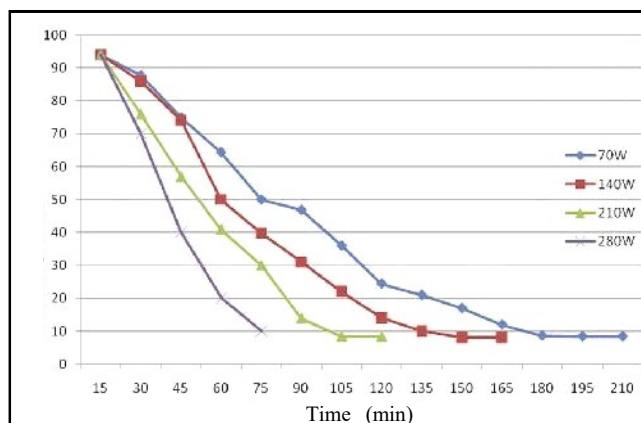


Fig. 2 : Rate of moisture per cent at microwave drying

**Analysis of *Bryophyllum pinnatum* leaves powder:**

In this research studied on proximate analysis of *Bryophyllum pinnatum* leaves powder like carbohydrate, protein, fat, fibre, moisture, ash, carbohydrate and minerals content present in *Bryophyllum pinnatum* powder.

**Chemical composition of *Bryophyllum pinnatum* leaves powder by using tray drying method :**

Analysis of *Bryophyllum pinnatum* leaves powder by using microwave drying method :

Proximate analysis of microwave drying like carbohydrate, protein, fat, minerals and fibre. These analysis of the results are given in Table 2.

**Chemical composition of *Bryophyllum pinnatum* leaves powder by using microwave drying:**

Analysis of *Bryophyllum pinnatum* leaves powder papdi:

The product is developed from by using the *Bryophyllum pinnatum* leaves powder in different proportion. These different proportions of *Bryophyllum*

Parameters	40°C	50°C	60°C	70°C	80°C
Moisture (%)	5.82 ± 0.01	5.70 ± 0.02	5.16 ± 0.29	4.90 ± 0.1	4.18 ± 0.17
Protein (%)	3.81 ± 0.68	3.90 ± 0.43	2.97 ± 0.63	4.84 ± 0.26	3.15 ± 0.35
Fat (%)	1.03 ± 0.05	1 ± 0.10	0.63 ± 0.05	2.17 ± 0.28	1.03 ± 0.15
Ash (%)	1.0 ± 0.01	1.2 ± 0.01	1.1 ± 0.02	1.2 ± 0.01	1.2 ± 0.01
Fibre (%)	1.03 ± 0.05	4.70 ± 0.2	4.41 ± 0.37	5.73 ± 0.19	2.65 ± 0.02
Calcium (%)	4 ± 0.5	3.70 ± 0.36	4 ± 0.5	4.30 ± 0.25	3.90 ± 0.45
Potassium (%)	4.96 ± 0.15	3.46 ± 0.20	3.66 ± 0.28	5.03 ± 0.15	4.66 ± 0.25
Carbohydrate (%)	89.95 ± 0.62	89.62 ± 0.39	90.33 ± 0.62	88.82 ± 2.24	90.88 ± 0.18

\*Each value is a mean of three determinations

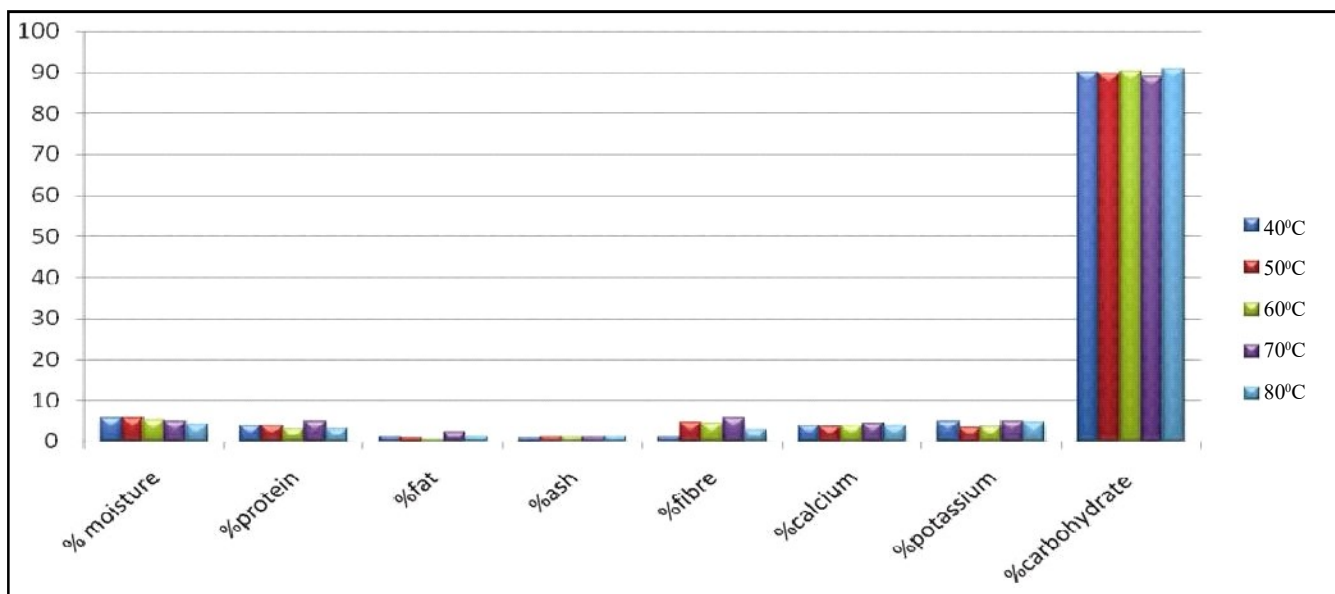


Fig. 3 : Chemical composition of *Bryophyllum pinnatum* leaves powder (Tray drying)

Table 2 : Chemical composition of *Bryophyllum pinnatum* leaves powder (microwave drying)

Parameters	70 W	140 W	210 W	280 W
Moisture (%)	4.10 ± 0.1	3.60 ± 0.06	2.35 ± 0.09	2.29 ± 0.7
Protein (%)	2.80 ± 0.47	4.19 ± 0.17	2.56 ± 0.020	2.21 ± 0.09
Fat (%)	0.67 ± 0.01	1.27 ± 0.06	0.87 ± 0.21	1.07 ± 0.06
Ash (%)	0.79 ± 0.01	0.81 ± 0.02	0.79 ± 0.01	0.80 ± 0.02
Fibre (%)	2.82 ± 0.27	4.11 ± 0.01	3.26 ± 0.21	2.90 ± 0.27
Calcium (%)	3.90 ± 0.45	3.8 ± 0.10	3.80 ± 0.15	2.70 ± 0.2
Potassium (%)	4.46 ± 0.25	4.46 ± 0.25	4.13 ± 0.32	4 ± 0.5
Carbohydrate (%)	91.63 ± 0.45	90.11 ± 0.18	93.41 ± 0.32	93.56 ± 0.11

\*Each value is a mean of three determinations

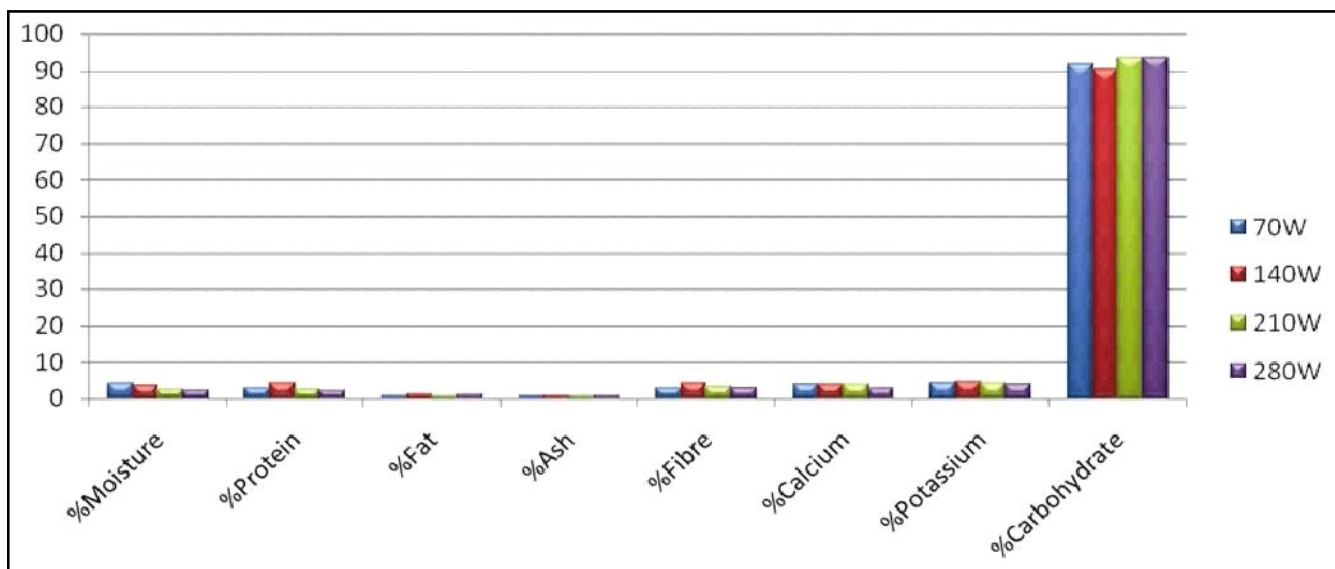


Fig. 4 : Chemical composition of *Bryophyllum pinnatum* leaves powder (Microwave drying)

**Table 3 : Composition of *Bryophyllum pinnatum* leaves powder papdi**

Parameters	T <sub>0</sub>	T <sub>1</sub>	T <sub>2</sub>	T <sub>3</sub>
Moisture (%)	1.22 ± 0.18	0.87 ± 0.02	0.79 ± 0.03	0.69 ± 0.06
Protein (%)	3.68 ± 0.27	5.84 ± 0.20	5.27 ± 0.26	4.76 ± 0.25
Fat (%)	30.94 ± 0.20	31.81 ± 0.17	39.71 ± 0.06	77.72 ± 0.04
Ash (%)	0.89 ± 0.11	0.89 ± 0.11	0.74 ± 0.03	0.93 ± 0.15
Fibre (%)	0.75 ± 0.05	0.79 ± 0.05	0.72 ± 0.03	0.77 ± 0.01
Calcium (%)	1.82 ± 0.02	2.80 ± 0.30	2.00 ± 0.09	2.40 ± 0.06
Potassium (%)	2.02 ± 0.06	2.85 ± 0.03	2.38 ± 0.02	2.41 ± 0.09
Carbohydrate (%)	63.41 ± 0.30	60.57 ± 0.27	53.47 ± 0.20	15.88 ± 0.32

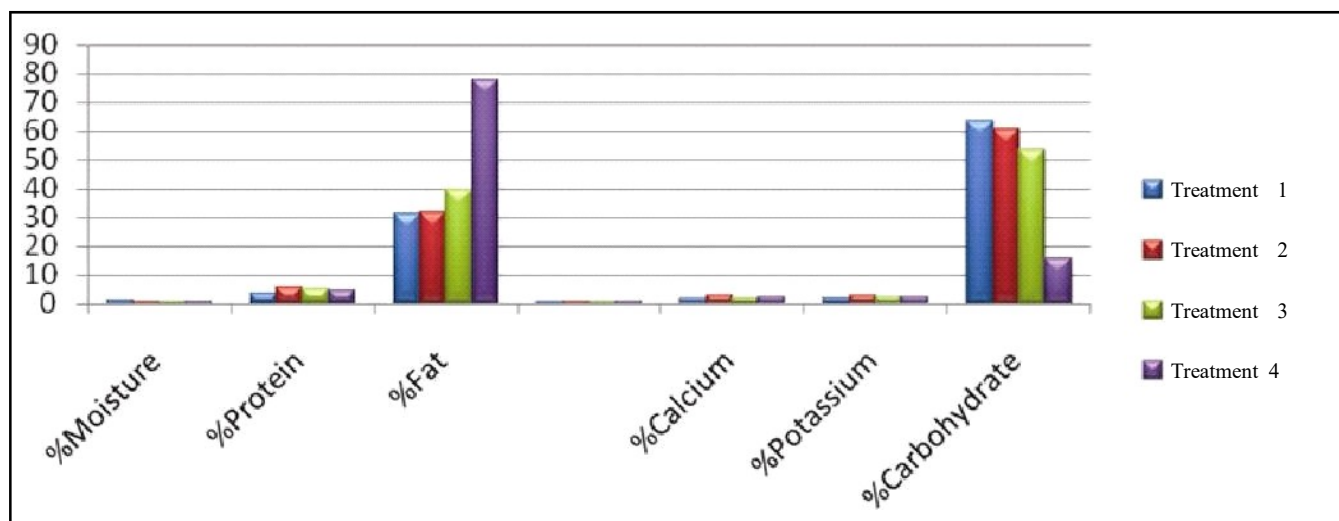
\*Each value is a mean of three determinations

\* T<sub>0</sub> - Control sample

\* T<sub>1</sub> - 3% *B. pinnatum* powder

\* T<sub>2</sub> - 6% *B. pinnatum* powder

\* T<sub>3</sub> - 9% of *B. pinnatum* powder

**Fig. 5 : Composition of *Bryophyllum pinnatum* leaves powder papdi**

*pinnatum* leaves powder are, T1- 3g, T2- 6g and T3-9g, respectively. For the preparation of the product tray drying temperature 700C was used on the basis of nutritional composition of powder (Fig. 3-5).

Composition of *Bryophyllum pinnatum* leaves powder papdi.

### Conclusion :

After the studied on the research paper we can be concluded that the *Bryophyllum pinnatum* herb, used worldwide. In this review studied on the ethanobotanical use of *Bryophyllum pinnatum* and supported the therapeutic utility of the plant in various disorders mainly in diseases of the urinary system without adverse side effect. This may be the reason *Bryophyllum pinnatum* used in treatment of wounds, burns and ulcer in herbal medicine. The extract from the leave could be a good source of useful drugs. The

use of *Bryophyllum pinnatum* leaf extract is only in the pharmaceutical for the preparation of different drugs for treating and curing the different diseases. We will be used leaf powder into the food product it's called food fortification. 700C temperature is used for the preparation of *Bryophyllum pinnatum* leaves powder papdi.

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