

## Antioxidant Activity in Aqueous Extracts of Powdered *Terminalia chebula* Seed Skin Stored for Six Months at Room Temperature and at 4°C

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**Abstract**— All living beings are likely to be exposed to oxidative damages which will lead to health related problems. Therefore preventive measures should be taken to minimize the oxidative damage. In indigenous Medicine, fruits and tender young fruits are used in the preparation of drugs, e.g. 'Kayakalpam' (Anti ageing drugs). The objective of this study was to estimate the antioxidant activity of the powder of *Terminalia chebula* seed skin. The cold and hot extracts were obtained from the powder stored at room temperature and at 4°C in monthly interval for six months and antioxidant activity was measured in terms of Ferric Reducing Antioxidant Power (FRAP). Initial FRAP of cold and hot water extracts was 8602.6 (±58.2) and 9119.1 (±21.9) µmol/g dry weight respectively. When the powder was stored at room temperature for a month the cold and hot water extracts contained 7752 (±86.2) and 8053.4 (±43.1) µmol/g dry weight of FRAP respectively. When the powder was stored at room temperature for 6 months, FRAP of cold and hot water extracts was 3963.9 (±216.2) and 4558.6 (±54.1) µmol/g dry weight respectively. The FRAP of cold and hot water extracts of the powder stored at 4°C for six months was 5416.7 (±255.8), 5555.6 (±73.1) µmol/g dry weight respectively. Extraction of FRAP was better with hot water than with cold water. FRAP of the powder decreased when stored both at room temperature and at 4°C. Both cold as well as hot extracts exhibited FRAP even after storing for 6 months. At 3 months the decline in FRAP of the powder stored at room temperature was higher than that stored at 4°C. Even though the powder showed FRAP for 6 months, it is perceived as favourable to prepare fresh powder for better FRAP.

**Keywords**— Ferric reducing activity, *Terminalia chebula*, Total antioxidant capacity, Siddha medicine

### I. INTRODUCTION

Free radicals are highly reactive and unstable compounds which are produced in the body during normal metabolic activities or introduced from the external environment such as pollution and cigarette smoke. Human bodies are protected from oxidative damages by free radicals

through some complex defense systems which involves antioxidants (Halliwell *et al.*, 1989). Plant drugs are frequently considered to be less toxic and free of side effects than synthetic ones (Wang and Ng, 1999). Indigenous system of medicine uses *Terminalia chebula* to treat diseases and promote positive health. It is extensively used as a rejuvenator in Siddha, Ayurvedha and Unani medicinal systems. *Terminalia chebula* is commonly called as black myrobalam, ink tree. It belongs to the family of Compretaceae. In English it is called as 'Chebolic myrobalan', in Tamil it is called as 'Kadukkaai' and in Sinhala it is called as 'Aralu'. Extract of the fruits of *T. chebula* posses anti diabetic activity and posses the antioxidant and oxygen species scavenging properties (Kumar *et al.*, 2006; Hazra *et al* 2010). It is recommended for the treatment of Diabetes mellitus infection (Kannan *et al.*, 2001), gastric ulcer, constipation, arthritis, cancer, skin diseases and anti-ageing (Murugesamuthliyar, 1998). It has been reported that *T. chebula* has antioxidant status in the liver and kidney of young and aged rats (Mahes *et al.*, 2009). Agasthiyar's verse about *T. chebula* is "Mother flourishes the child by feeding food but *T. chebula* flourishes the child by relieving them from the diseases" and indicates that *T. chebula* has been given more significance than the mother. As *Terminalia chebula* is widely used in Siddha medicine, it was decided to determine its antioxidant activity in terms of Ferric Reducing Antioxidant Power (FRAP).

### II. MATERIALS AND METHODS

#### A. Plant material

Mature fruits of *Terminalia chebula* were collected from Meesalai of Jaffna peninsula.

#### B. Preparation of plant extract

Skin of *T. chebula* seeds was cleaned, washed and dried under shade at room temperature. Then powdered and sieved with muslin cloth and stored in airtight container. Three mg quantities packets were stored at 4°C and at room temperature. The cold and hot aqueous extract using stored powder was prepared at monthly interval.

Dissolved in 20ml distilled water and one part was kept at room temperature and the other part was kept in water bath at 100°C for 5 minutes. Then these were centrifuged at 10,000 rpm for 10 minutes. Supernatants were analysed for Ferric Reducing Antioxidant Power (FRAP, Benzie and Strain, 1999).

### III. RESULTS AND DISCUSSIONS

Initially the Ferric Reducing Antioxidant Power (FRAP) of the cold and hot extracts of *Terminalia chebula* seed skin powder e was 8602.6 (±58.2) and 9119.1 (±21.9) µmol/g dry weight respectively (Table 1). The FRAP was better extracted with hot water than with cold water and hence when compared with the cold extracts, the hot extracts contained higher FRAP (Table 1).

When the powder was stored at room temperature for a month and the FRAP was analysed, the cold and hot water extracts contained 7752 (±86.2) and 8053.4 (±43.1) µmol/g dry weight respectively. The skin of the seeds powder stored at room temperature for six months

showed FRAP of 3963.9 (±216.2) and 4558.6 (±54.1) µmol/g dry weight respectively in cold and hot water extracts. With time, the FRAP of the powder stored at room temperature decreased. After six months of storage at room temperature, FRAP in cold extract and hot extract were 53 and 50% of the initial FRAP content (Table 1).

When the powder was stored at 4°C for a month and the FRAP was analysed, the cold and hot water extracts contained 8233.2 (±52.3) and 8572.7 (±43.5) µmol/g dry weight respectively (Table 1). When compared with the cold extracts, the hot extracts contained higher FRAP than cold extract (Table 1). The powder stored at 4°C for six months showed FRAP of 5416.7 (±255.8) and 5555.5 (±73.1) µmol/g dry weight respectively in cold and hot water extracts. With time, the FRAP of the skin of the seeds powder stored at 4°C decreased. After six month of storage at room temperature, FRAP in hot extract was 1.15 times higher than that in the cold extract (Table.1)

Table 1. Ferric Reducing Antioxidant Power (FRAP) of cold and hot water extracts of the powder of *Terminalia chebula* seed skin stored at Room Temperature and at 4°C.

Time (Month)	Ferric Reducing Antioxidant Power (µmol/g)			
	Room Temperature		4° C	
	Cold extract	Hot extract	Cold extract	Hot extract
0	8602.6 (±58.2)	9119.1 (±21.9)	-	-
1	7752.0 (±86.2)	8053.4 (±43.1)	8233.2 (±52.3)	8572.7 (±43.5)
2	6459.9 (±430.7)	7002.9 (±60.3)	6666.6 (±36.95)	6962.2 (±73.9)
3	6167.7 (±138.6)	6583.4 (±69.3)	6370.9 (±13.4)	6619.6 (±33.6)
4	5539.7 (±67.9)	5661.9 (±230.8)	5575 (±225.1)	6597.4 (±329.0)
5	5378.5 (±240.2)	5531.3 (±7.3)	5562.5 (±132.0)	5604.2 (±159.7)
6	3963.9 (±216.2)	4558.6 (±54.1)	5416.7 (±255.8)	5555.5 (±73.1)

#### IV. CONCLUSION

When compared with the cold extracts, hot extracts contained higher FRAP. FRAP was retained better at 4°C than at Room temperature. FRAP decreased with the storage period at both temperatures, but decrease in FRAP was higher at room temperature than at 4°C.

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