NUTRITIONAL AND IN VITRO ANTIOXIDANT PROPERTIES OF *MANILKARA HEXANDRA* ROXB. FRUIT

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ABSTRACT

Manilkara hexandra Roxb. is a wild edible plant. It is a member of the Sapotaceae family, which is often known as Khirni. The native population of Kolhapur, Satara and Sangali district and the surrounding area rely heavily on plants for their dietary needs. Traditionally ripened fruits have economic, medicinal as well as food value. The plant have anti-ulcer, anti-inflammatory, anti-helmintic, and antibacterial activity. The plant was chosen for this study because of its medicinal and culinary characteristics. The current study looked at the nutritional and antioxidantcontent of mature and ripened *M. hexandra* fruits. Nutritional composition of ripened fruits shows high amount of moisture (70.80%), carbohydrates (10.22 ± 0.6g/100g), energy (86.38 ± 0.01Kcal), phosphorus (0.67 ± 0.05g/100g), calcium (0.82 ± 0.002g/100g), iron (0.028 ± 0.00g/100g), manganese (0.34 ± 0.00mg/100g) and copper (3.6 ± 0.01mg/100g) as compareto mature fruits of *M. hexandra.* The antioxidant activity of the methanolic extract was assessed by measuring the scavenging activity of DPPH, FRAP, Ferrous ion chelating ability,Reducing power assay, and TAC. In analysis ripened fruit show higher DPPH radical scavenging activity (66.49%), ferrous ion chelating ability (75.10%) and TAC (0.01 mg AAE) while mature fruit show higher FRAP (0.69 mg AAE) and reducing power capacity.

Keywords: *Manilkara hexandra* Roxb. fruits, Proximate analysis, Carbohydrates, Macro and micro nutrients, Antioxidant analysis.

INTRODUCTION

Traditional people utilized the majority of the wild kinds of fruits. The gathering and eating of wild fruits is a part of rural people's everyday activity. These plants are important as a supplement in the fight against hunger. Edible plants found in the wild play a significant part in food diversification (FAO, 2005). People in developing communities do not have access to adequate food grains and nutrient-dense foods to meet their needs. Wild plants are being used as a major source of food and other life-sustaining resources in developing countries. Wild fruits include a variety of nutrient-dense substances such as carbohydrates, minerals, vitamins, flavourings, antioxidants, and secondary metabolites (FAO, 1999). It is necessary to investigate the nutritional qualities of these wild food plants in order to ensure their long-term use. In contrast, there is a growing interest in the antioxidant phytoconstituents found in food. In account of this, the current study was conducted to determine the nutritional and antioxidant capabilities of *M. hexandra* fruits. The presence of sticky white latex in the bark, branches, leaves, and ripe fruits distinguishes this plant (Malik et al., 2010). People used toeat ripened fruits uncooked (Misra and Misra, 2016). As they are classified as wild plants, their dispersal is natural and limited to the wild. *M. hexandra's* economic situation was not adequately handled.

MATERIALS AND METHODS

Collection of plant material

M. hexandra fruits were collected from Kolhapur district and the adjoining area. Plants were identified by comparing their characteristics to those found in the Flora of Kolhapur District (Yadav and Sardesai 2002). Fruits were properly cleaned and segregated as they matured. Fruit seeds were removed and the fleshy edible section was dried in the shade and then baked at 40°C. Dried fruit pulp was ground in a mixer and utilized for further evaluation.

Proximate analysis

Moisture balance has been used to determine dry matter and moisture content (Shimadzu MOC 63u). The AOAC method was used to determine total ash and crude protein value (1990). Sadasivam and Manickam (1992) technique were used to determine crude fat and crude fibre content.

Nutritional analysis

Carbohydrates content were estimated according to the method Nelson (1944). The method of Atwater system was used to determine the energy values (WHO, 1985).

Mineral Analysis

The acid digestion method of Black et al. (1965) was used to analyse inorganic contents, while the Atomic Absorption Spectrophotometer was used to estimate calcium, magnesium, iron, manganese, zinc, and copper. Phosphorus was analyzed from the same aciddigest by the method described by Sekine et al. (1965). The total nitrogen content was estimated using Hawk et al. method (1948).

Antioxidant analysis

Methanolic extract of fruits was prepared by homogenizing the fruit pulp in methanol and extracting was done on an orbital shaker for 24 hrs at room temperatures. It was then filtered using Whatman No. 1 filter paper. Antioxidant capacity was determined via filtration. Lee et al. measured the antioxidant activity of methanolic extract using 1, 1-diphenyl-2-picrylhydrazyl (DPPH) (2003). The activity of ferric reducing antioxidant power (FRAP) was measured using Benzie and Strain's technique (1996). The methods of Decker and Welch (1990) and Oyaizu (1986) were utilized to estimate ferrous ion chelating ability and reducing power, respectively. Total antioxidant capacity was evaluated by the method of Prieto *et al.* (1999).

RESULTS

The proximate, carbohydrate, and mineral content of mature and ripened *M. hexandra* fruits were investigated. The larger quantity of dry matter is shown in a proximate analysis of fruit (Graph 1). (40 ± 0.01%), ash (10.9 ± 0.001%), and crude fibre (8.26 ± 0.01%) in mature fruits whereas ripened fruits was rich in moisture (70± 0.03%), crud fat (0.31 ± 0.01%) and crude protein (16.89 ± 0.01%).

Carbohydrates were the primary energy source. *M. hexandra* fruits were a good source of carbohydrates (Graph 2). Mature and ripened fruits contain starch (1.47 ± 0.04g/100g and 2.74 ± 0.04g/100g), reducing sugar (0.080 ± 0.003g/100g and 0.655 ±0.024g/100g) and total sugar (3.90 ± 0.01g/100g and 6.24 ± 0.03g/100g).

The mineral composition of fruits showed that the mature and ripened fruits had similar mineral amounts. (Graph 3 and 4). Mature and ripened fruits having (2.778 ± 0.001g/100g and 2.275± 0.001g/100g) nitrogen, (0.189 ± 0.001g/100g and 0.656 ± 0.001g/100g) phosphorus, (1.66 ± 0.001g/100g and 0.66 ± 0.001g/100g) potassium,(0.060 ± 0.001g/100g and 0.080 ±

0.001g/100g) calcium, (0.005 ± 0.002g/100g and 0.005 ± 0.003g/100g) magnesium, (0.130 ± 0.001g/100g and 0.120 ± 0.001g/100g) sodium,(26.60 ± 0.001mg/100g and 28.20 ± 0.01mg/100g) iron, (0.26 ± 0.01mg/100g and 0.34 ± 0.01mg/100g) manganese, (2.84 ± 0.01mg/100g and 2.43 ± 0.01mg/100g) zinc and (3.40 ± 0.01mg/100g and 3.60 ± 0.01mg/100g) copper. Nutritional composition of ripened fruits shows high amount of moisture, crude fat, crude protein, carbohydrates, energy (86.38 ± 0.01Kcal), nitrogen, phosphorus, calcium, iron, manganese and copper as compare to mature fruits of *M. hexandra*

To investigate the antioxidant power of mature and matured *M. hexandra* fruits, antioxidant study was performed using methanolic extract fruits. The DPPH scavenging activity of *M. hexandra* ripening fruits is greater (66.49 ± 0.03%) than the mature fruits (58.78 ± 0.07%) (Graph 5). The IC_{50} value of ripened fruit was 9 µg/ml for methanolic extract. The mature fruits (0.69 ± 0.001 mg AAE /ml of extract) show comparatively higher ferric reducing antioxidant power than the ripened fruits (0.61 ± 0.02 mg AAE /ml ofextract) (Graph 6). At 1mg/ml methanolic extract of ripened fruits shows highest percent inhibition activity of ferrous ion (75.10 ± 0.05%) (Graph 7). Reducing capacity of sample served as an indicator of potential antioxidant power. It is found that the absorbance of the extract increased with an increase in concentration of extract. Mature fruits show higher reducing power capacity (0.376 ± 0.001) than the ripened fruits (0.293 ± 0.001) (Graph 8). Thetotal antioxidant capacity of ripened fruits (0.01 ± 0.002 mg AAE /ml of extract) is higher at 0.5 mg/ml of extract than the mature fruits (0.009 ± 0.000 mg AAE /ml of extract) (Graph 9). It was revealed that antioxidant activity improves as the concentration of extracts increases in all antioxidant tests.

DISCUSSION

Nutrient composition and antioxidant profile of Sapota was studied by Rampriya et al., (2015) and Baskar et al., (2020). In related to Sapota, member of family sapotaceae like *Mimusops elenji, Palaquium ellipticum* (Nazarudeen 2010), the present investigated fruit of *M. hexandra* shows comparatively more proximate compounds, mineral nutrition. Whereas, comparatively equal amount of nutrition present in *Madhuca longifolia* Ramadan et al.(2016). Madani et al., (2018) given all information about the cultivation, preharvesting and postharvesting treatments, environment, fruit nutrition, antioxidant potential of *Manilkara achras* Forb. In comparison with the *M. achras* and *M. zapota* (Singh et al., 2021) fruit the *M. hexandra* have more potential source of nutrition as well as antioxidants.

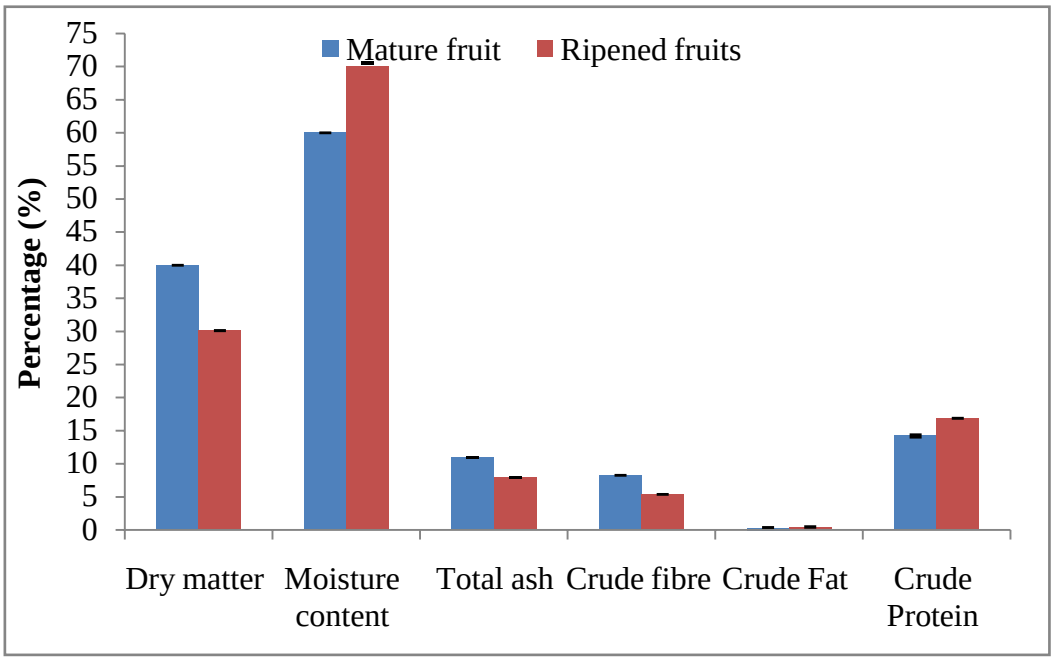
Dutta and Ray (2020) assessed the antioxidant activity of *M. hexandra* methanolic leaf and bark extracts in vitro. The methanolic extract of *M. hexandra* leaf has higher invitro

antioxidant potentials and total phenolics content than the bark, according to the researchers. The same analysis was carried out in the current experiment, and it was discovered that *M. hexandra* fruits had comparable antioxidant capacity.

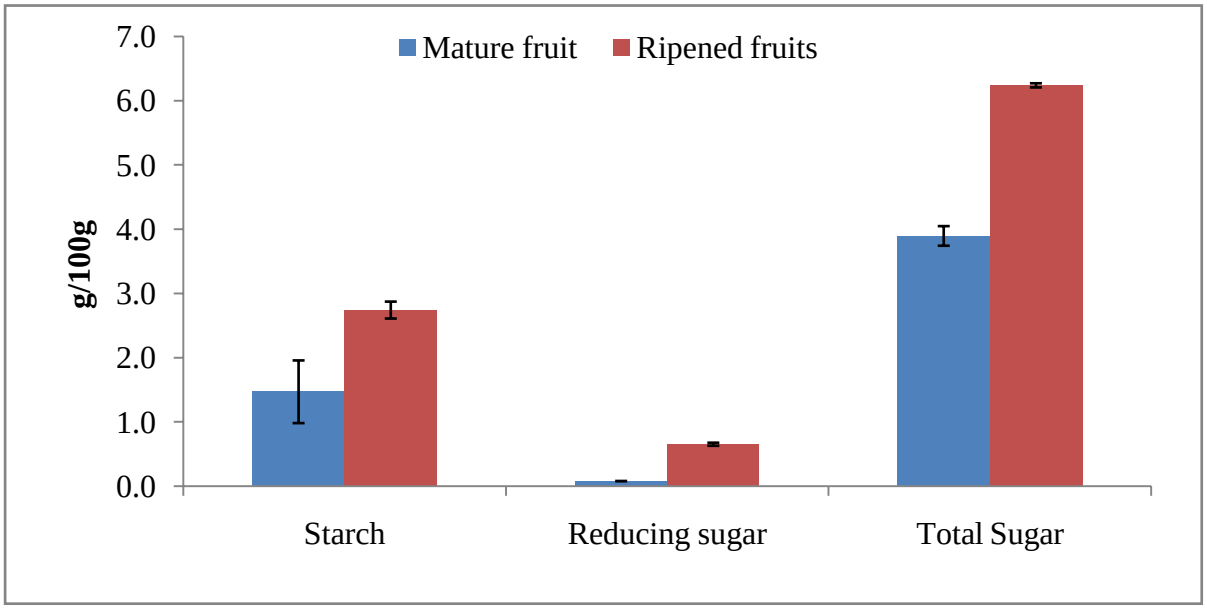
Tamsir et al. (2020) investigated the antioxidant capabilities of *M. zapota's* peel, leaves, and seed. They discovered that the leaves of *M. zapota* were a better source of antioxidants than the fruits. *M. zapota* fruits were shown to be a better antioxidant source than *M. hexandra* fruits. However, in rural places, *M. hexandra* were readily available, and complete cultivation requirements are not required. Parikh and Patel (2017) investigated the phenolic content and antioxidant activity of *M. hexandra*. They claimed that, when compared to *M. hexandra* seed, fruits were a rich source of phenolic components such as gallic acid, quercetin, and kaempferol, as well as antioxidants.

CONCLUSION

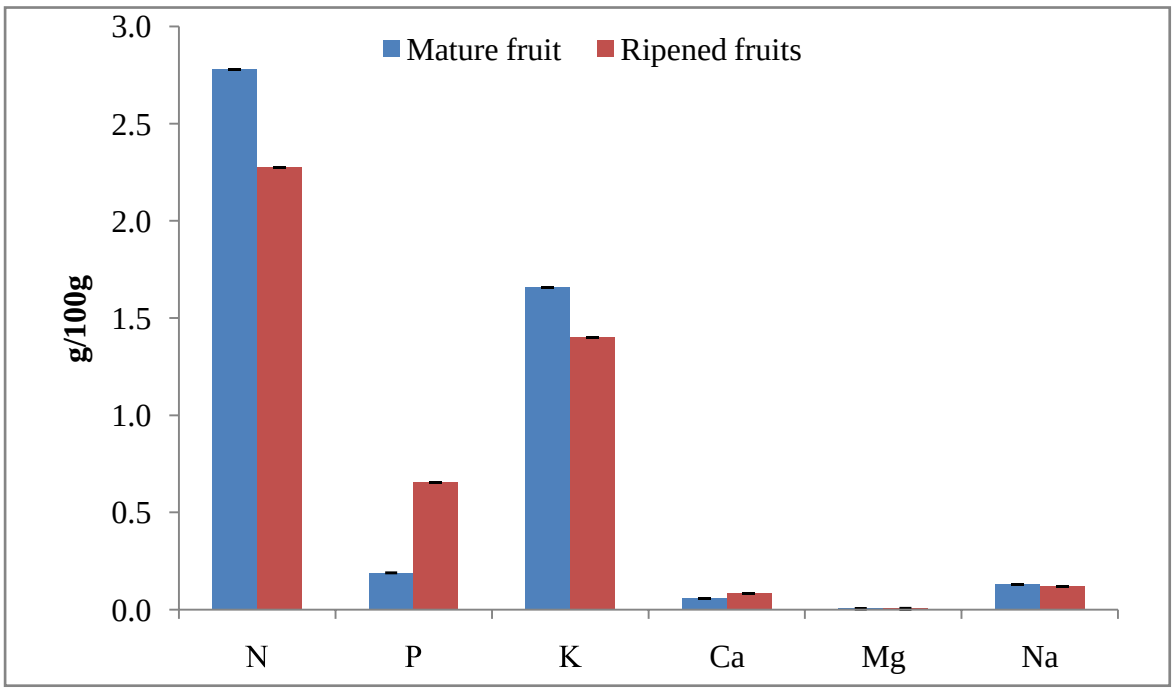
The results of this study indicate that *M. hexandra* fruits have a great nutritive value, and that the methanolic extract of *M. hexandra* fruits might be a good source of antioxidants and could help to prevent or reduce the progression of oxidative stress-related degenerative disorders. However, further research is needed to investigate the underlying processes of antioxidant action and to identify the active molecules responsible for these pharmacological effects.



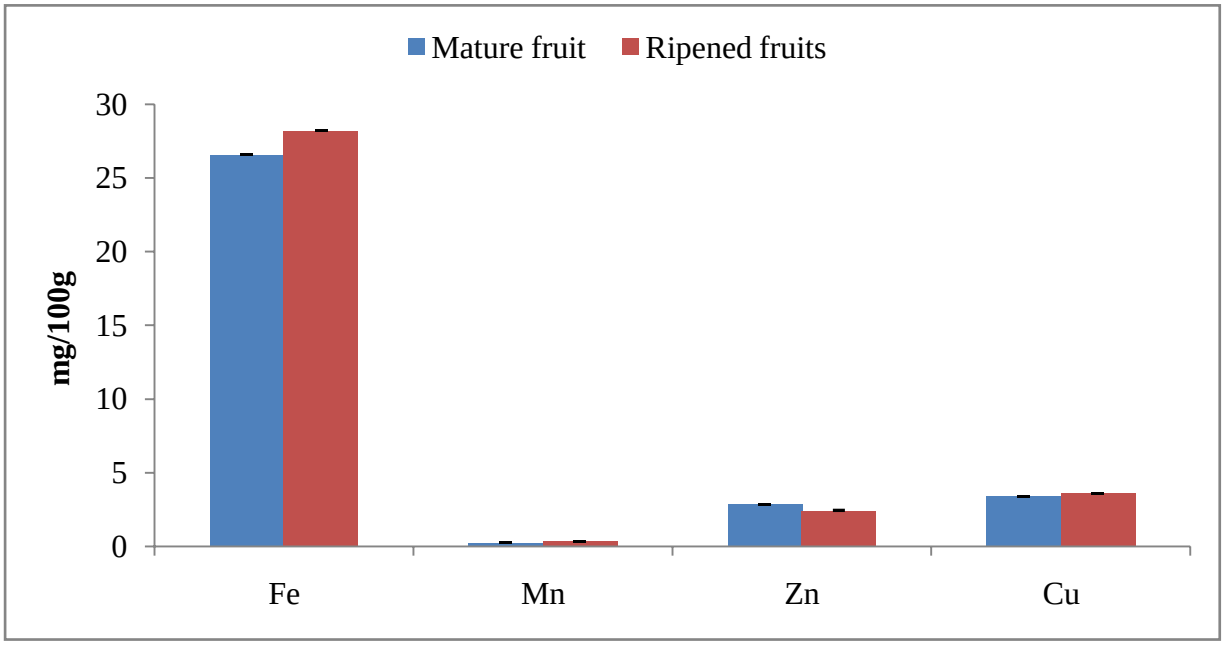
Graph 1. Proximate analysis of *Manilkara hexandra* fruits



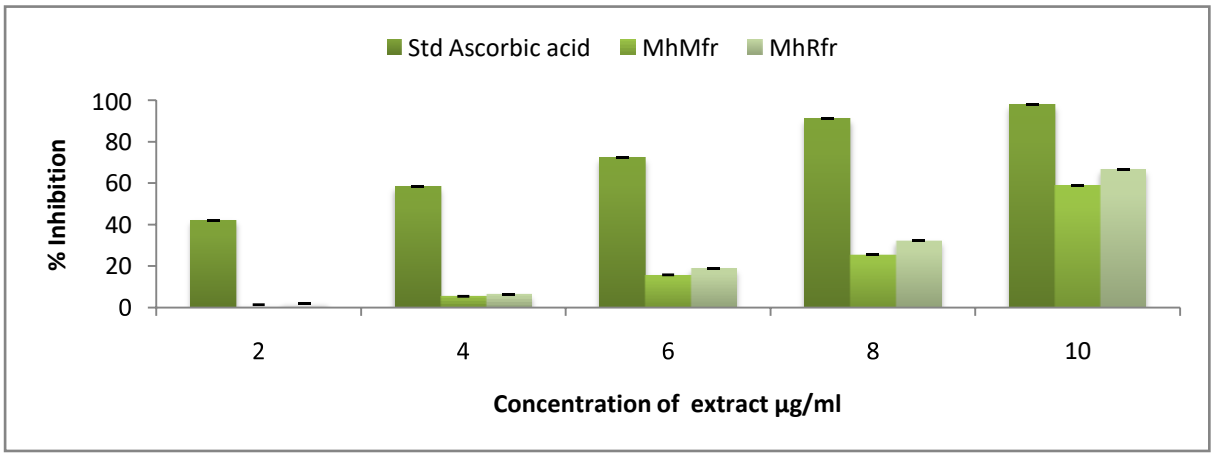
Graph 2. Carbohydrate analysis of *Manilkara hexandra* fruits



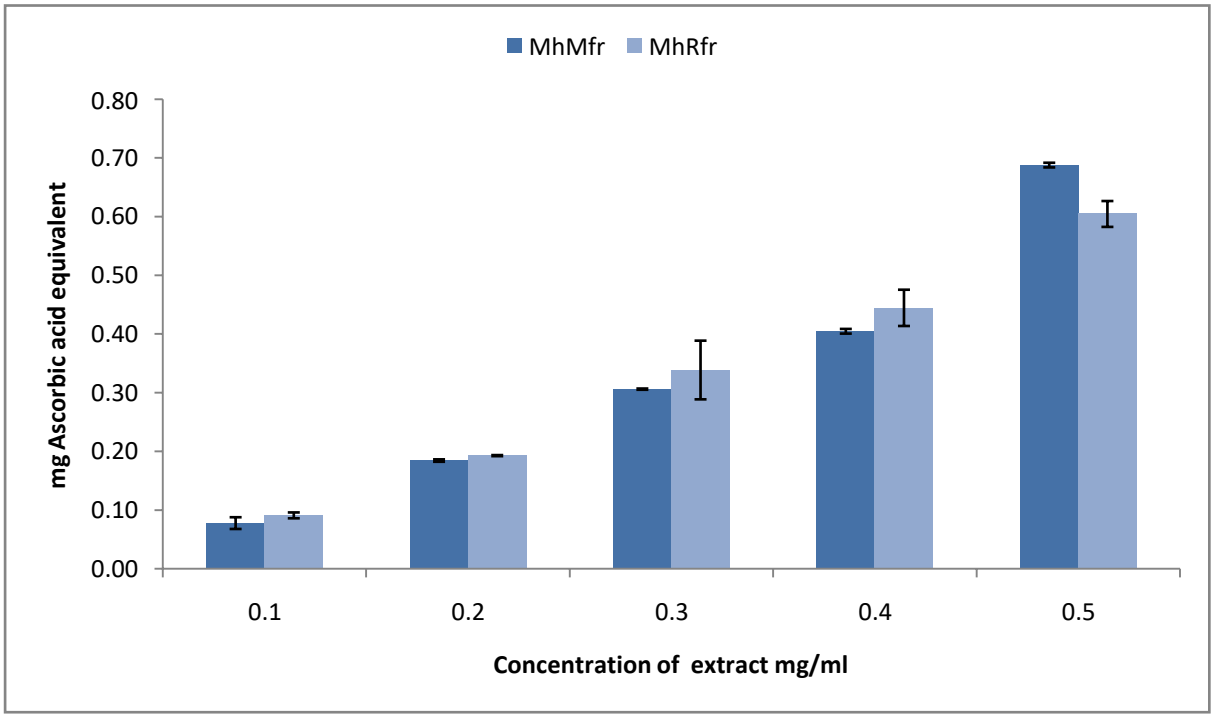
Graph 3. Macro elements of *Manilkara hexandra* fruits



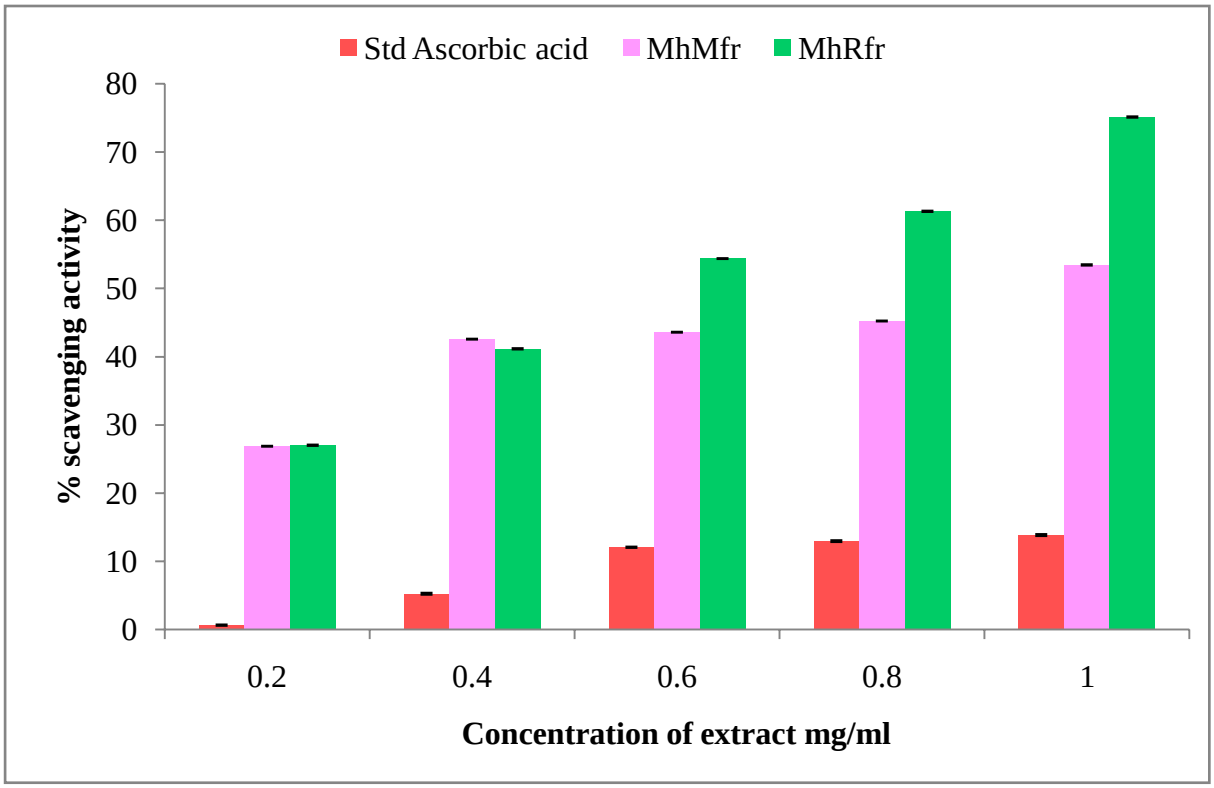
Graph 4. Micro elements of *Manilkara hexandra* fruits



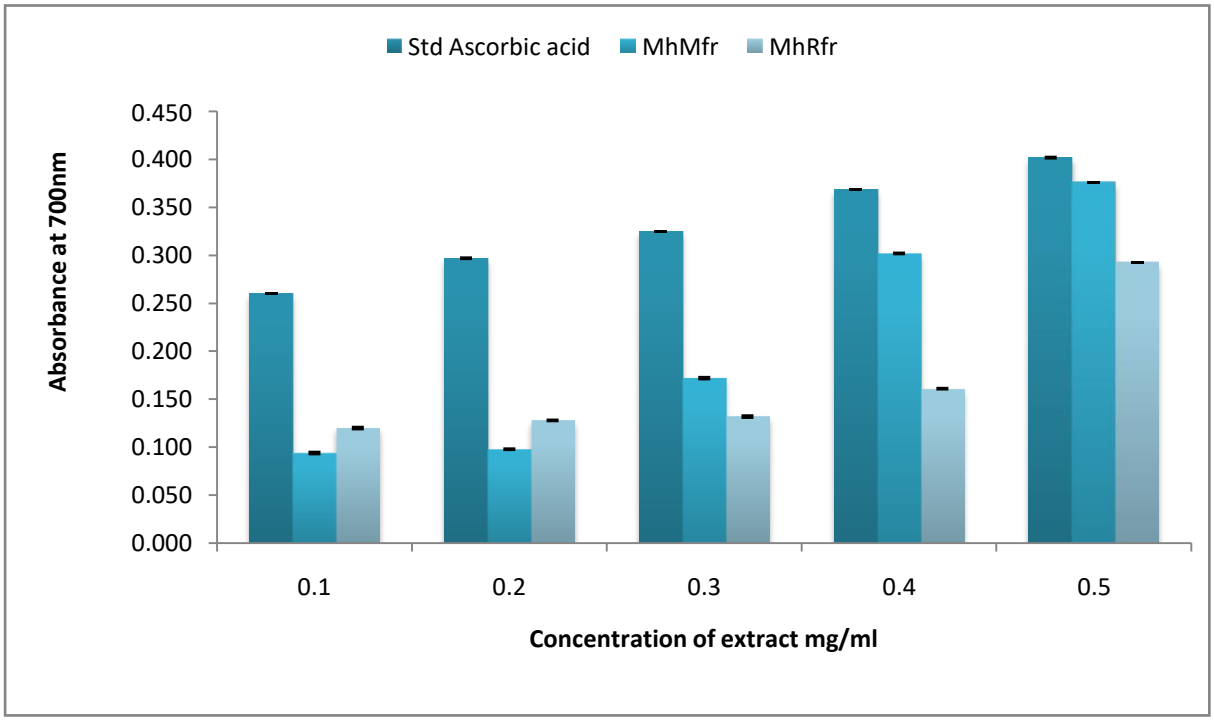
Graph 5. DPPH radical scavenging activity of *M. hexandra* extracts.



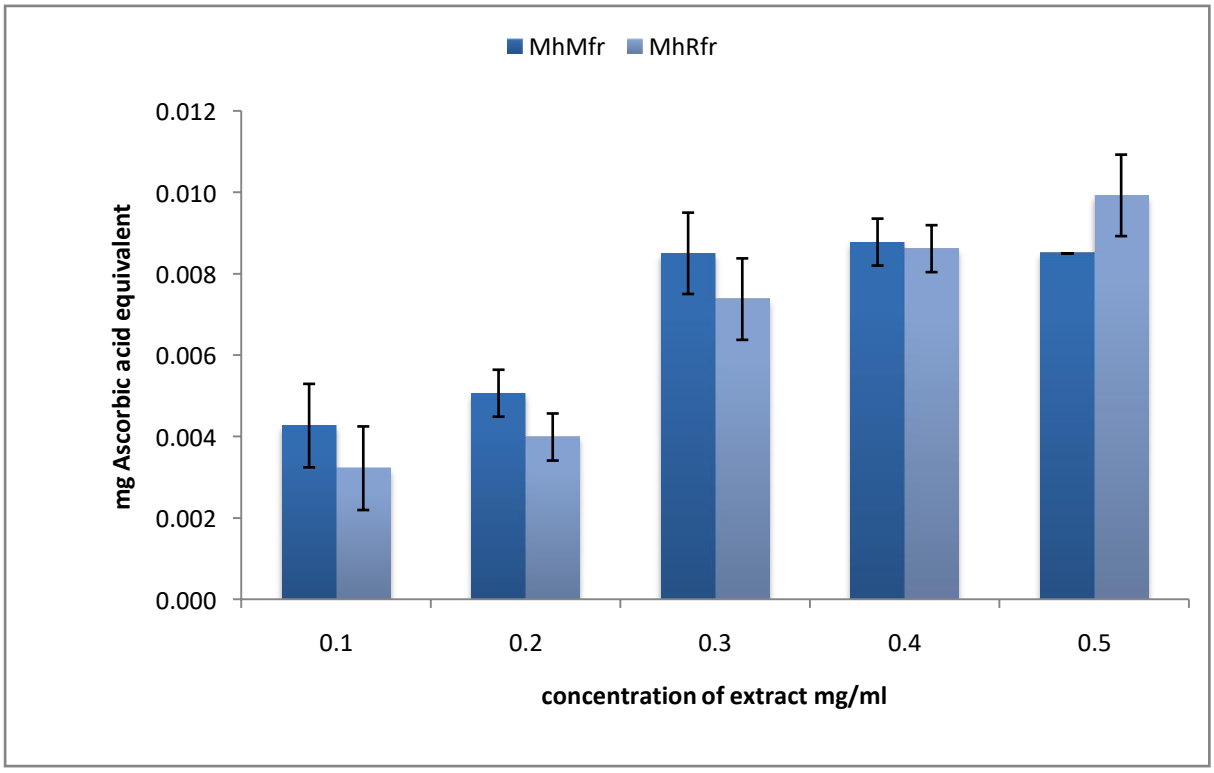
Graph 6. Ferric reducing antioxidant power (FRAP) mg AAE/ml *M. hexandra* fruits



Graph 7. Ferrous ion chelating activity in *M. hexandra* fruits



Graph 8. Reducing power in *M. hexandra* fruits



Graph 9. Total antioxidant capacity of *M. hexandra* fruits

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