



Evaluation of physicochemical analysis of nutritious cookies prepared by incorporating chia seed powder and garden cress seed powder

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ABSTRACT

Based on such challenges, wheat flour must be substituted with other materials in order to reduce gluten and improve the physicochemical properties of cookies. Cookies are extensively consumed and are an excellent platform for functional delivery. The majority of Indians follow a vegetarian diet, with cereals and pulses supplying most of their energy and protein. The objectives of this study are to describe the physicochemical characteristics of the cookies developed with chia seed and garden cress seed powder. The physicochemical attributes of cookies include carbohydrate content (%), amount of protein (%), fat content (%), ash content (%), total solid content (%), moisture content (%), the amount of crude fiber (%), anti-oxidant content (%), and energy content. The information obtained was analysed using one-way ANOVA at a level of significance of 5%. The amounts of carbohydrates content, protein content, fat content, content of ash, total solid content, amount of moisture, crude fiber content, anti-oxidant content, and the percentage of energy were found to be (51.94-55.21%), (12.70-15.22%), (23.07-26.23%), (2.15-3.10%), (95.08-96.49%), (3.51-4.70%), (12.00-15.45%), (12.64-38.39%), and (487.07-504.71), accordingly. Based on physicochemical characteristics, T12: T1: T2 cookies were preferred over other formulations.

Key words: Physicochemical, Chia seed, Garden cress seed powder, Gluten, Nutrition.

INTRODUCTION

Bakery products are ready to eat, suitable and cheap food products carrying digestive and dietary principles of vital importance. The cookies become popular both in rural and urban population in India. These bakery products have about 6-7% proteins. Cookies owing to their long shelf life are considered useful for nutritional enrichment in feeding programs. In recent years, consumption of bakery products has increased in most of countries as they

served as important source of nutrients (**Ranhotra, 1980**). The main aim of the food industry is to obtain safe food without contaminating elements which can produce diseases or be harmful to human beings. In addition, food must have beneficial physical and psychological effects on people. The consumer must feel at ease at the time of eating knowing that the food is not only palatable but also healthy (**Acuna, 2011**). Wheat is a major cereal crop in many parts of the world. It belongs to the Triticum family, of which there are many thousands of species, with *T. aestivum* subspecies *Vulgare* and the hard wheat *Triticum Durum* being the most important commercially. Wheat is grown as both a winter and a spring cereal and, owing to the number of species and varieties and their adaptability; it is grown in many countries around the world (**Slavin, 2005**). Wheat is generally not classed by variety. Instead, classes are used, based on the time of year the wheat is grown and the milling and baking quality of the flour produced. Within each class there is a group of different varieties of wheat with similar characteristics (**Slavin, 2005**). Healthy food composition has become more important than feeding people; As a result, the development of new products and healthy recipes that have a positive effect on health in terms of nutritional content has been the focus of scientific food studies. In recent years, chia (*Salvia hispanica* L.) seeds have been considered to be a popular food ingredient because of its health benefits. Chia seed (CS) is an annual herbaceous plant, typical of Mexico and Central America, and presents considerable amounts of dietary fiber, which helps to keep the water in its structure, to increase the feeling of satiety, to slow down digestion, and to lower insulin levels (**Vuksan et al., 2007**). Garden cress (*Lepidium sativum*) seeds also known as Halim in Hindi is reddish brown seeds obtained from Garden cress plant (*Lepidium sativum*, family- Cruciferae), an important nutritional and medicinal plant in India since Vedic era due to its health promoting properties. (**Gopalan et al., 2009**) Garden cress seed (*Lepidium sativum* L.), an unexplored health grain, is a rich source of nutrients, nutraceuticals, and possess numerous beneficial properties. Garden cress seeds show many medicinal properties such as anti-diabetic, hypocholesterolemic and anti-hypertensive. Garden cress seeds can be used as a promising multipurpose medicinal source (**Eddouks et al., 2005**).

MATERIALS AND METHODS

Preparation of cookies

The research project “**Evaluation of physico-chemical analysis of cookies prepared by incorporating chia seed powder and garden cress seed powder**” was carried out in the research Lab of Department of Food and Dairy Technology, Warner College of Dairy Technology, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj (Prayagraj), U.P. (India). In the current inquiry, several tools and machinery were employed, such as a Soxhlet apparatus, centrifuge, electronic balance, kjeldahl apparatus, muffle furnace, hot air oven, texture analyzer, and bakery oven. The equipment's utilized were from different department's viz., Department of Food and Dairy Technology, Warner College of Dairy Technology.

Cookies prepared by incorporation with chia seed and garden cress seed powder viz., wheat flour, Chia Seed Flour and Garden Cress Seed Flour powder. The cookies were evaluated for physicochemical properties.

Estimation of Physicochemical characteristics of cookies viz., carbohydrates content (%) (AOAC 2000), protein content (%) (AOAC 2005), fat content (%) (AOAC 2000), ash content (%) (AOAC 2005), total solids content (%) (AOAC 2000), moisture content (%) (AOAC 2005), crude fiber content (%) (AOAC 2000), antioxidant activity (%) (AOAC 2000) and total energy (kcal) (AOAC 2000) were determined in all the types' ratio of cookies.

Statistical analysis

The analysis of variance revealed at significance of $p > 0.05$ level, S.E. and C.D. at 5 % level was done.

RESULTS AND DISCUSSION

The data collected on different aspects, as per the methodology were tabulated and analyzed statically. The findings are also represented diagrammatically. The data regarding physicochemical properties such as carbohydrate content (%), protein content (%), fat content (%), ash content (%), total Solid content (%), moisture content (%), crude fibre content (%), anti- oxidant content (%) and energy content (cal) of cookies prepared by incorporation with chia seed and garden cress seed powder.

Carbohydrate content

It is evident from the figure no.1 that the highest average value of carbohydrate content (%) (57.16) was obtained in the treatment M_0 . Whereas lowest value of carbohydrate content (%) (51.94) was obtained in the treatment M_{xiii} . The present study is very close to the findings of **Barrientos et al. (2012)**.

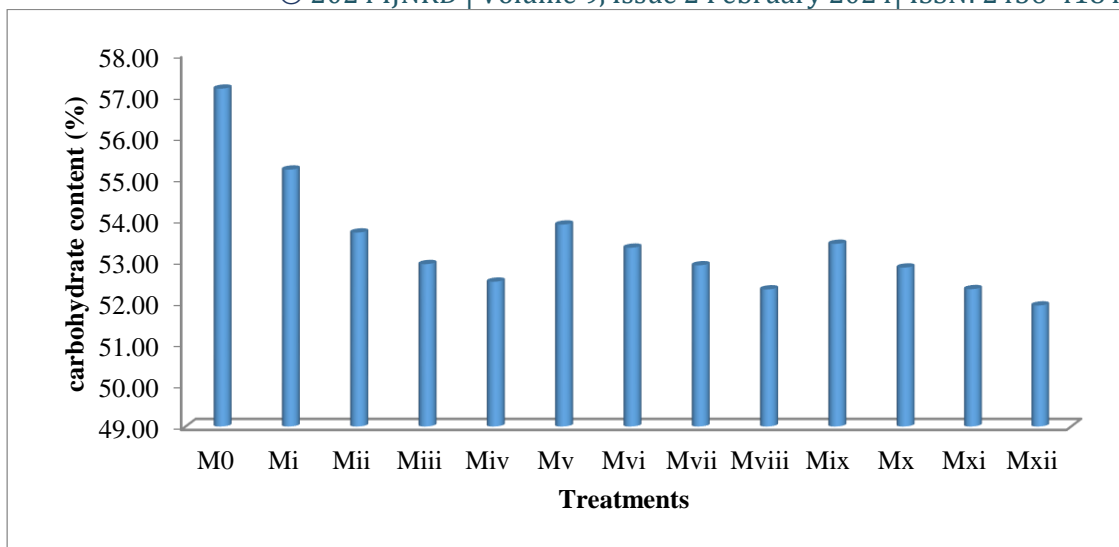


Figure:1 Graphical representation of carbohydrate content (%) of final developed Cookies.

Protein content

It can be observed from figure 2 that the protein content (%) in samples of experimental of final developed Cookies of different treatment highest average value of protein content (%) (15.22) was obtained in the treatment M_{xii}. Whereas lowest value of protein content (%) (12.70) was obtained in the treatment M₀. The present study is very close to the findings of **Brandao et al. (2019)**. The protein content was significant difference ($P < 0.05$) between different treatments.

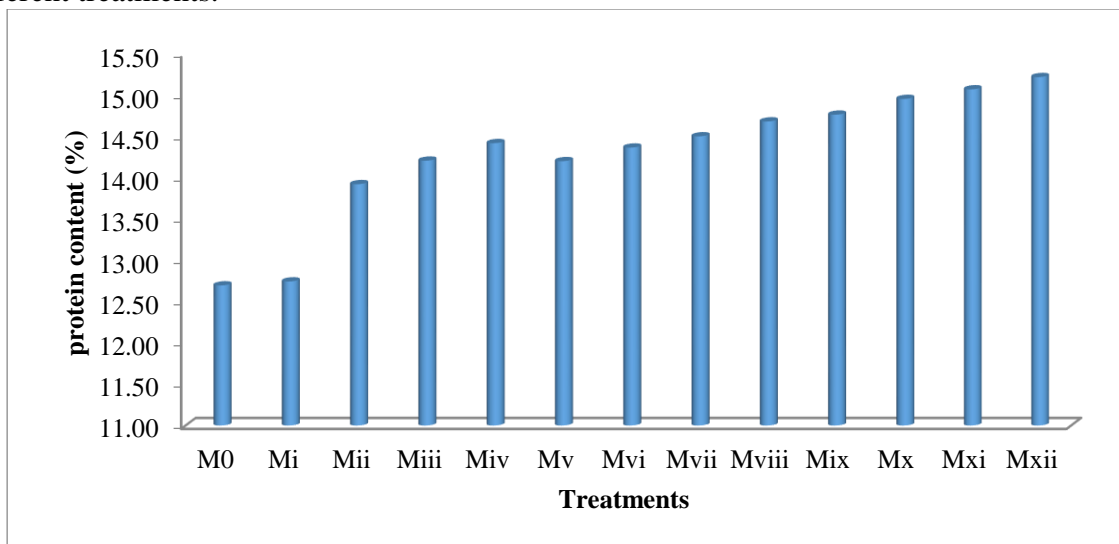


Figure: 2 Graphical representation of protein content (%) of final developed Cookies.

Fat content

There was significant difference ($P < 0.05$) between different treatments it varied from the figure 3 that the highest average value of fat content (%) (26.23) was obtained in the treatment M_{xii}. Whereas lowest value of fat content (%) (23.07) was obtained in the treatment M₀. The present study is very close to the findings of **Barrientos et al. (2012)**.

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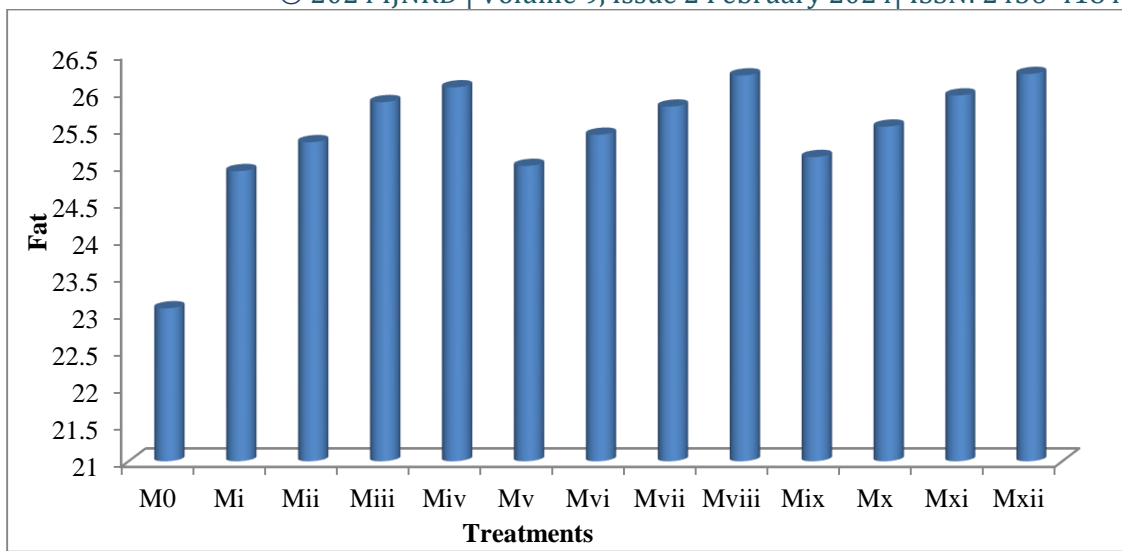


Figure: 3. Graphical representation of fat content (%) of final developed Cookies.

Ash content

Ash content of developed cookies is shown in figure 4. That the ash content (%) in samples of experimental of final developed Cookies of different treatment that the highest average value of Ash content (%) (3.10) was obtained in the treatment M_{xii}, whereas lowest value of Ash content (%) (2.15) was obtained in the treatment M₀. The present study is very close to the findings of **Brandao *et al.* (2019)**. There was significance difference in ash content.

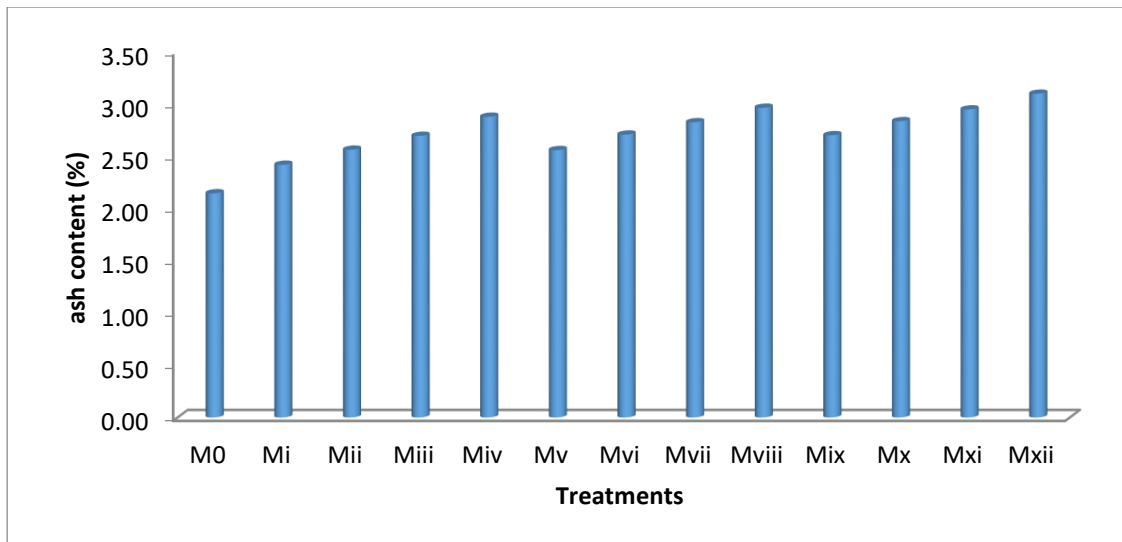


Figure: 4. Graphical representation of ash content (%) of final developed Cookies.

Total solid

Total solid content of develop cookies was calculated and shown in Figure 5. That the average content found all treatments was range of 95.08 to 96.49%. It is evident that highest average value of total solid content (%) (96.49), was obtained in the treatment M₀. Whereas lowest value of total solid content (%) (95.08) was obtained in the treatment M_i. Total solid content significant difference ($P < 0.05$) between different treatments.

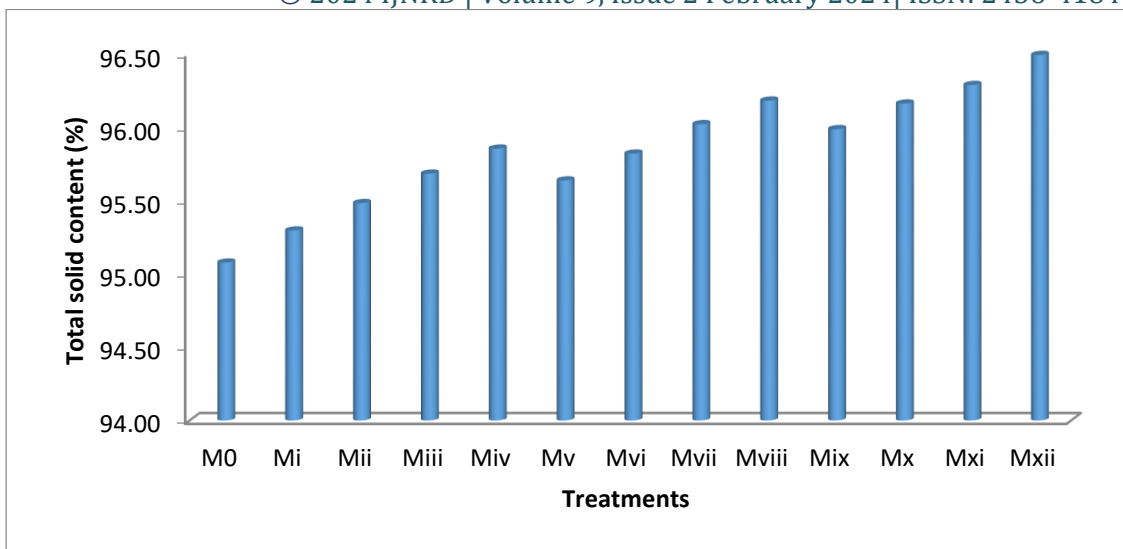


Figure: 5. Graphical representation of total solid content (%) of final developed Cookies.

Moisture Content

Moisture content of prepared cookies was found in the highest average value of total moisture content (%) (4.92) was obtained in the treatment M₀. Whereas lowest value of total moisture content (%) (3.51) was obtained in the treatment M_{xii}. The present study is very close to the findings of Arafat *et al.* (2021).

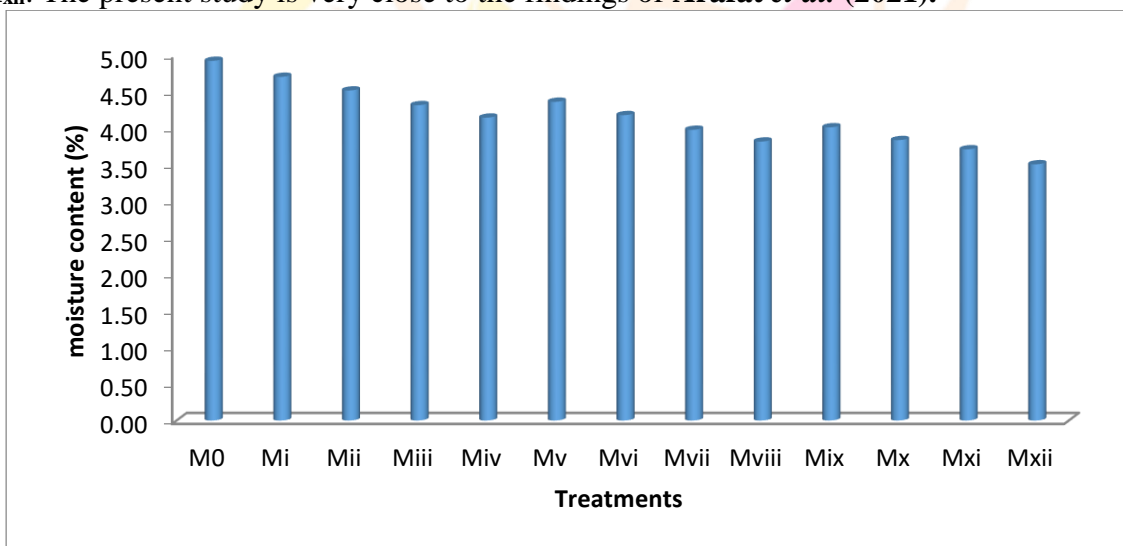


Figure: 6. Graphical representation of moisture content (%) of final developed Cookies.

Total Crude Fibre

It is evident from the figure 7 that the highest average value of total crude fibre content (%) (15.45) was obtained in the treatment M_{xii}. Whereas lowest value of total crude fibre content (%) (12.00) was obtained in the treatment M₀. The present study is very close to the findings of Chellamboli *et al.* (2019). The present study showing significant difference (P<0.05) between different treatments.

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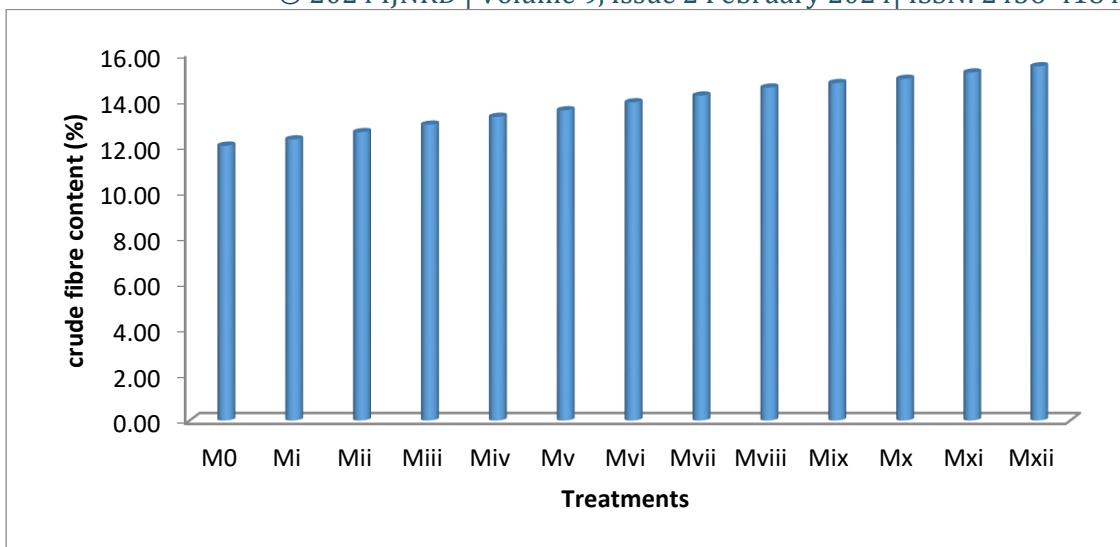


Figure 7. Graphical representation of crude fibre content (%) of final developed Cookies.

Total Anti- Oxidant Content

Total Anti- Oxidant Content of developed cookies shown in figure 8 that the highest average value of total anti-oxidant content (%) (38.39) was obtained in the treatment M_{xii}. Whereas lowest value of total anti-oxidant content (%) (12.64) was obtained in the treatment M₀. The above parameter also showing significant difference (P<0.05) between different treatments.

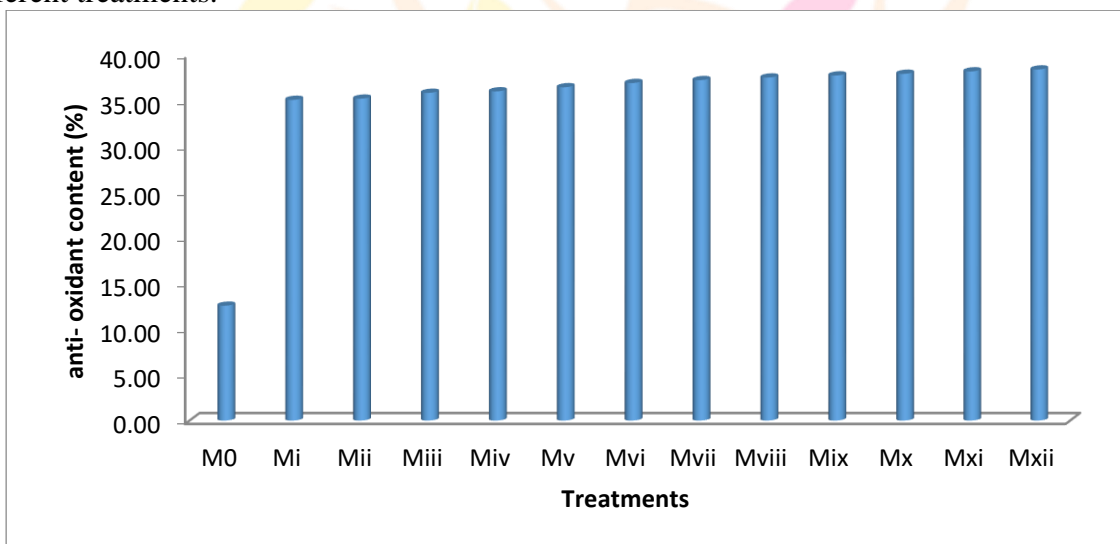


Figure 8. Graphical representation of anti-oxidant content (%) of final developed Cookies.

Total Energy Value

A total energy value in kilocalories which is contained in foodstuffs. It helps to provide physiological functions of a human body. It is evident from the figure 9 that the highest average value of total energy content (cal) (504.71) was obtained in the treatment M_{xii}. Whereas lowest value of total energy content (cal) (487.07) was obtained in the treatment M₀. The total energy value also showing significant difference (P<0.05) between different treatments.

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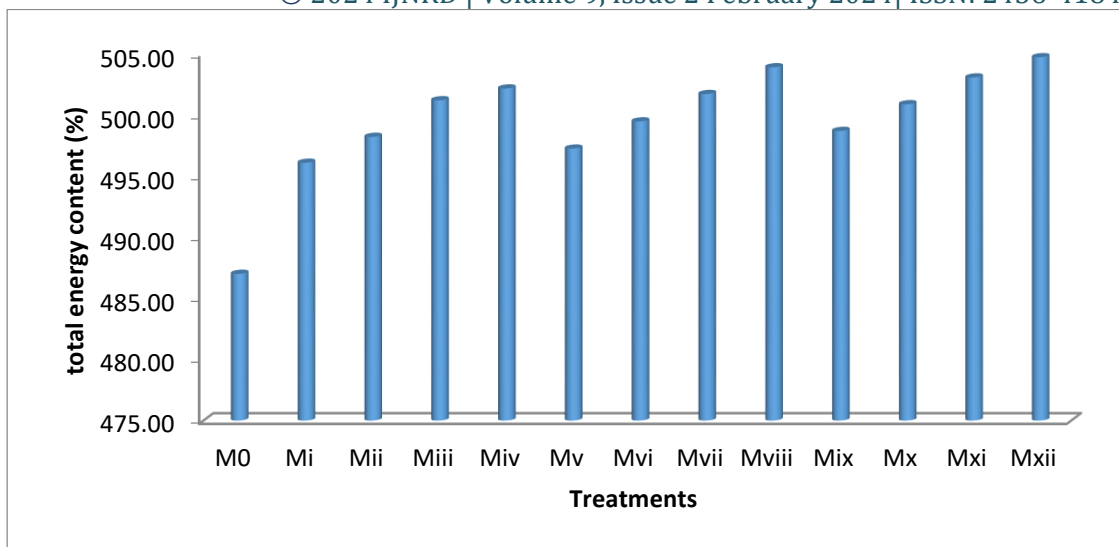


Figure: 9. Graphical representation of total energy content (%) of final developed Cookies

Conclusion

The physicochemical properties of develop cookies results show the contents of carbohydrate content, protein content, fat content, ash content, total Solid content, moisture content, crude fibre content, anti-oxidant content and energy content were obtained in the range of (51.94-57.16%), (12.70-15.22%), (23.07-26.23%), (2.15-3.10%), (95.08-96.49%), (3.51-4.92%), (12.00-15.45%), (12.64-38.39%) and (487.07-504.71cal) respectively. Based on the physicochemical properties, T12: Wheat Flour (60%) + Chia Seed Flour (25%) & Garden Cress Seed Flour (15%), T1: Wheat Flour (85%) + Chia Seed Flour (10%) & Garden Cress Seed Flour (05%) and T2: Wheat Flour (80%) + Chia Seed Flour (15%) & Garden Cress Seed Flour (05%) cookies were most preference than other formulations. The cookies produced believes have low gluten and food physicochemical properties.

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