**IN-VITRO ANTI-INFLAMMATORY EVALUATION OF ETHANOL EXTRACTS OF Moringa oleifera, Thymus vulgaris AND THEIR 1:1 EXTRACT BLEND ON PROTEIN DENATURATION**

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**Abstract:** *Moringa oleifera* and *Thymus vulgaris* are well known and widely used herbs, which contains several interesting bioactive constituents and possesses health promoting properties. The aim of the present study is to evaluate and compare their *in vitro* anti-inflammatory effects of ethanol extracts of *Moringa oleifera* and *Thymus vulgaris* and a 1:1 blend of the two extracts against the denaturation of proteins. The test extracts and the reference drug of varying concentrations were incubated with egg albumin under controlled experimental conditions and subjected to determination of absorbance to assess the anti-inflammatory property. A standard anti-inflammatory drug, ibuprofen, was used as reference drug. The results obtained showed a concentration-dependent inhibition of protein (albumin) denaturation by both extracts, including the 1:1 blend of the extractas well as the reference drug. The extract concentrationas well as the reference drugfor 50% inhibition (EC$_{50}$) was determined by the dose-response curve using GraphPad Prism 6.01 software package and were as follows: *Moringa oleifera* (EC$_{50}$ = 215.9±29.8 μg/mL); *Thymus vulgaris* (EC$_{50}$ = 144.9±1.1 μg/mL); the extracts blend (EC$_{50}$ = 441.6±8.6 μg/mL) and ibuprofen (EC$_{50}$ = 1599±337 μg/mL), respectively. These findings showed that both *Moringa oleifera* and *Thymus vulgaris* possessed marked in vitro anti-inflammatory effect against the denaturation of protein when compared with the standard anti-inflammatory drug, ibuprofen. *Thymus vulgaris* extract was found to be more active than *Moringa oleifera*, possibly due to the higher flavonoids and/or organic acid contents.

**Keywords:** *Moringa oleifera*, *Thymus vulgaris*, Ibuprofen, anti-inflammation, protein denaturation

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**Introduction**

Herbs and vegetables are important components of human diet and give protections against many common illnesses and diseases, especially cardiovascular diseases, high blood pressure, stroke, oxidative stresses, cancer, obesity, diabetes and neurodegenerative conditions (Kavalcová et al., 2014). Various spices and herbal extracts are used for preservation of food, as well as appetizers; and the medicinal value of plants lies in the presence of different phytochemical components (tannins, alkaloids, terpenoids, flavonoids and phenolic compounds) that bring particular physiological effect in human body (Mousavi et al., 2011; Javed et al., 2013). The world health organization estimated that 80% of the world population uses medicinal plant for the treatment of disease and in African countries, this rate is much higher. It has been estimated that up to 90% of the population in developing countries rely on the use of medicinal plants to help meet their primary health care need (Segismundo et al., 2008).

At least 25% of drugs used in modern pharmacopoeia are derived from plant while many are synthetic analogue built based on prototype compounds isolated from plants (Singh et al., 2012). Medicinal plants contain combinations of several chemical compounds having multiple biological activities. Medicinal plants are increasingly becoming the subject of extensive studies worldwidefor their active therapeutic principles (Monira et al., 2012; Shallangwa et al., 2013a; 2013b). The rich wealth of plant kingdom can represent a novel source of newer compounds with significant pharmacological effects such as anticancer, anti-pneumonia, anti-diarrhea, anti-dysentery antiviral, antimicrobial include anti-inflammatory activities. The major merits of herbal medicine seem to be their perceived efficacy, low incidence of serious adverse effects and more affordable treatment (Iwu et al., 1999).

Inflammation is a bodily response to injury, infection or destruction characterized by heat, redness, pain, swelling and disturbed functions (Shallangwa et al., 2013b; Huo et al., 2013). Inflammation is a normal protective response to tissue injury caused by physical trauma, noxious chemical or microbial agents. It is the body response to inactivate or destroy the invading organisms, to remove the irritants and set the stage for tissue repair. It is triggered by the release of chemical mediators’ from injured tissue and migrating cells (Huo et al., 2013; Lee et al., 2013). Anti-inflammatory refers to the property of a substance or treatment that reduces inflammation. Anti-inflammatory drugs make up about half of analgesics, remedying pain by reducing inflammation as opposed to opioids, which affect the central nervous system (Gan et al., 2010; Monira et al., 2012; Shallangwa et al., 2013b).

The most commonly used drug for management of inflammatory conditions are non-steroidal anti-inflammatory drugs (NSAIDs) and steroids which have several adverse effects especially gastric irritation leading to formation of gastric ulcers (Monira et al., 2012; Shallangwa et al., 2013b). One of the features of several non-steroidal anti-inflammatory drugs for example indomethacin, ibufenac, ibufenamic acid and salicylic acid is their ability to prevent denaturation of heat treated bovine serum albumin (Umapathy et al., 2010; Chandra et al., 2012a; 2012b) at pathological pH (pH 6.2 – 6.5).

Some plants, vegetables and fruits are reported to be rich sources of antioxidants, such as vitamin A, vitamin C, Vitamin E, carotenoids, polyphenolic compounds, flavonoids and hydrolysable tannins, which can significantly destroy the free radicals, reactive oxygen species responsible for degenerative diseases or prevent free radical damage, thus reducing the risk of chronic diseases (Umapathy et al., 2010). These plants include *Ocimum basilicum*, *Cinnamomum cassia*, *Ginkgo biloba*, *Camellia sinensis*, *Aloe vera*, *Malus domestica*, *hibiscus sabdariffa*, *Prunella vulgaris*, *Thymus vulgaris*, *Moringa oleifera* and quite a number of others.
Moringa oleifera Lam, a flowering plant, is one of the fourteen species of the genus Moringa of the Moringaceae family, found in Nigeria, India, Pakistan, Afghanistan, Bangladesh and in other parts of Africa and Latin America (Araújo et al., 2012; Adejumo et al., 2012). Moringa oleifera is widely distributed and naturalized in different climate and could be found even in the harshest and driest of soils (Adejumo et al., 2012). In some parts of the world Moringa oleifera is referred to as the ‘drumstick tree’, ‘tree for purifying’ or the ‘horse radish tree’ (Aney et al., 2007). Moringa oleifera leaves are reported to be a rich source of β-carotene, protein, vitamin C, calcium and potassium and act as a good source of natural antioxidants; and thus can enhance the shelf-life of fat containing foods due to the presence of various types of compounds that possess antioxidant properties, such as ascorbic acid, flavonoids, phenolics and carotenoids (Anwar et al., 2007). Studies focusing on the chemical composition of this plant have identified many bioactive substances that may confer diverse pharmacological properties to the preparations obtained from its leaves, root (Aney et al., 2009; Goyal et al., 2007; Anwar et al., 2007), bark (Aney et al., 2009; Goyalet al., 2007; Anwaret al., 2007), gum (Aney et al., 2009; Goyal et al., 2007), fruit (Aney et al., 2009; Anwar et al., 2007), flowers (Adejumo et al., 2012; Aney et al., 2009; Anwaret al., 2007), seeds and seed oil (Araújo et al., 2012; Adejumo et al., 2012; Menaiyan et al., 2014).

Thymus vulgaris (Thyme) is aperennial, aromatic herb native to Asia, the Mediterranean region and Europe, belongs to the Lamiaceae family (Swaye et al., 2014; Rodrigues et al., 2015). Thymus vulgaris is now widely cultivated in many parts of the world and is used as spice, tea and herbal drugs (Abd El Kader et al., 2012; Hamzawy et al., 2012; Swaye et al., 2014; Rodrigues et al., 2015). Thymus vulgaris possess various beneficial effects, such as stimulant for the entire circulatory system, antiseptic, antimicrobial, antibacterial, anti-helmintic, insecticidal, antifungal, antiviral, antioxidant, activities and, is also effective in the treatment of depression and mood changes (Vale-Silva et al., 2010; Abd El Kader et al., 2012; Hamzawy et al., 2012; Miguel et al., 2012; Zuzarte et al., 2013; Swaye et al., 2014; Rodrigues et al., 2015). Thyme oils are also used in flavor and food industries, mainly in the manufacture of perfumes and cosmetics, or for flavoring chocolates, toothpastes, mouthwashes, and cough medicines (Vale-Silva et al., 2010; Miguel et al., 2012; Rodrigues et al., 2015). All these activities are related to the high content of phenolic compounds, with special emphasis in thymol and carvacrol (Alizadeh et al., 2002; Shallangwa et al., 2013a; Sileyet al., 2014; Rodrigues et al., 2015). This study is carried out to evaluate the total phenolic and flavonoid contents, and compare the possible anti-inflammatory effects of ethanol extracts of Moringa oleifera and Thymus vulgaris against the denaturation of protein in vitro.

Materials and Methods
The method used for assessing the anti-denaturation effects of natural products with anti-inflammatory properties is simple and inexpensive, as has been reported by several authors (Jagtap et al., 2011; Shallangwa et al., 2013a; Shallangwa et al., 2013b; Shallangwa et al., 2015).

Chemicals and drugs
The reference drug used for this work, Ibuprofen Perrigo brand (800 mg per tablet) was purchased from Beautiful Pharmaceutical Drug store, opposite North-Gate, Ahmadu Bello University, Samaru-Zaria. Other reagents (hydrochloric acid, sodium dihydrogenphosphate, disodiumhydrogenphosphate, sodium chloride, glycerol) used were of analytical grades from BDH, M&B, Sigma or, Fluka.

Plant materials
Moringa oleifera leaves were obtained from a farm located in Kura Local Government Area of Kano State, Nigeria; while Thymus vulgaris leaves were collected from Tiger Foods Limited, located in Awada Layout, Obosi, Anambra State, Nigeria. Both plants leaves were identified by a plant taxonomist, Mr. Namadi Sanusi at the Department of Botany, Faculty of Sciences, Ahmadu Bello University, Zaria, Kaduna state, Nigeria, where voucher specimen (Moringa oleifera, v/no: 571) and (Thymus vulgaris, v/no: 1933) were deposited.

Preparation of extracts
The fresh Moringa oleifera and Thymus vulgaris leaves materials were washed and chopped into bits and air-dried at room temperature for 7 days. The respective dried samples were separately ground in a laboratory grinder until smooth powders were obtained in order to ensure high surface area for increased diffusion. 50.00 g of each crushed plant materials were extracted with 80% ethanol by cool extraction for one week with constant shaking. The extracts were filtered using 110 mm Filtpap filter paper and allowed to dry in an open dish on a water bath controlled at 80°C till constant weight was obtained. The percentage yield of each of plant was calculated. The dry extracts were kept in a vacuum desiccator until ready for use (Shallangwa et al., 2013b).

Estimation of total phenolic compounds and flavonoids
For the determination of total phenolic and flavonoid contents, stock solutions of gallic acid and rutin were prepared from which various concentrations (5, 10, 15, 20, 25, 30 µg/mL) used for plotting calibration curves were prepared by serial dilution. The amount of total phenolics in extracts was determined according to the Folin-Ciocâlteu procedure (Kahkonen et al., 1995; Shallangwa et al., 2013b). Samples (200 µL, three replicates) were introduced into test tubes; 1.0 mL of Folin-Ciocâlteu’s reagent and 0.8 mL of sodium carbonate (7.5%) were added. The tubes were mixed and allowed to stand for 30 min. Absorption at 765 nm was measured on Helios Gamma UV-vis spectrophotometer, UVG-101505. The total phenolic content was expressed as gallic acid equivalents (GAE) in micrograms per milligram dry extract material (Shallangwa et al., 2015); while the total flavonoid content of crude extract was determined by the aluminum chloride colorimetric method (Chang et al., 2002; Shallangwa et al., 2013b). 50 µL of crude extract (1 µg/mL ethanol) were made up to 1 mL with methanol, mixed with 4 mL of distilled water and then 0.3 mL of 5% NaNO2 solution; 0.3 mL of 10% AlCl3 solution was added after 5 min of incubation, and the mixture was allowed to stand for 6 min. Then, 2 mL of 1 mol dm-3 NaOH solution were added, and the final volume of the mixture was brought to 10 mL with doubly distilled water. The mixture was allowed to stand for 15 min, and absorbance was measured at 510 nm. The total flavonoid content was calculated from a calibration curve, and the result was expressed as rutin equivalents (RE) in micrograms per milligram dry extract material. (Shallangwa et al., 2015).

In-vitro anti-inflammatory activity
The screening for anti-inflammatory activity was carried out according to a modification of the in vitro protein...
denaturation bioassay methods described by Shallangwa et al. (2015), Jagtap et al. (2011) and and Sakat et al. (2010). Anti-inflammatory bioassay in vitro consist of reaction mixture (5 mL) which are 0.2 mL of egg albumin (from fresh hen’s egg), 2.8 mL of phosphate buffered saline (PBS, pH 6.4) and 2 mL of varying concentrations of Moringa oleifera extract (of final concentrations 50, 100, 200, 400, 800, 1600 µg/mL, respectively). Similar compositions of 0.2 mL of egg albumin (from fresh hen’s egg), 2.8 mL of phosphate buffered saline (PBS, pH 6.4) were made where no drug or test sample was added but only varying amounts of doubly distilled water to serve as control for the respective runs. Then the mixtures were incubated at (37±2°C) in Corsair Heating & Catering Limited incubator for 15 min. Denaturation was induced by keeping the reaction mixtures at 60±2°C in water bath for 10 min. After cooling, the turbidity was measured at 660 nm (using SHIMADZU UV 1800 Spectrophotometer). Percentage of inhibition of denaturation was calculated from control where no drug was added. Each experiment was done in triplicate and the average taken. Similar procedures adopted for the Moringa oleifera extract and Thymus vulgaris extracts were applied to Moringa oleifera extracts. For the 1:1 blend, the anti-inflammatory bioassay in vitro reaction mixture (5 mL) consisted of 0.2 mL of egg albumin (from fresh hen’s egg), 2.8 mL of phosphate buffered saline (PBS, pH 6.4) and 1 mL of varying concentrations of each of the plant extracts, Moringa oleifera and Thymus vulgaris (of final concentrations 50, 100, 200, 400, 800, 1600 µg/mL, respectively). The Ibuprofen tablet at the final concentrations of 50, 100, 200, 400, 800, 1600 µg/mL, respectively were also used as reference drug and treated similarly as the Moringa oleifera and Thymus vulgaris extracts for determination of absorbance. Each experiment was done in triplicate and the average taken. The percentage inhibition of denaturation was calculated using following formula (Jagtap et al., 2011; Chandra et al., 2012b):

\[
\% \text{Inhibition} = 100 \left( \frac{V_c}{V_t} - 1 \right)
\]

Where

- \(V_c\) = mean absorbance of test sample.
- \(V_t\) = mean absorbance of control.

Statistical analysis

All the pharmacological test data are expressed as the Mean±Standard Error of the Mean (SEM). The 50% Inhibitory Concentrations (IC\textsubscript{50}) expressed as 50% Effective Concentrations (EC\textsubscript{50}) were determined at 95% Confidence Intervals after logarithmic transformation of the concentration-response (three parameters) curve using GraphPad Prism 6.01 software. The Efficiency Index (EI) was expressed as EC\textsubscript{50}/E\textsubscript{max}.

Results and Discussion

The overall extraction yield of Moringa oleifera and Thymus vulgaris were 33.59% and 23.79% dry weight materials. The study also revealed that the extracts were rich in phenolic and flavonoids. The results obtained for this study are in agreement with previous studies done by Vongsak et al. (2013) for Moringa oleifera; and Alizadeh (2013), Sabetsarvestani et al. (2013) for Thymus vulgaris. Total polyphenols of the extract of Moringa oleifera and Thymus vulgaris were estimated by the Folin-Ciocalteu method, calculated from a calibration curve \((R^2 = 0.9939)\), as 8.96±2.41 µg of GAE/mg and 20.86±1.66 µg of GAE/mg, respectively, dry weight extract. The total flavonoid contents of the two plants ethanolic extracts were calculated from a calibration curve \((R^2 = 0.9568)\) and are as presented in Table 1. It has been reported widely that phenolic and flavonoids content show significant antioxidant action on human health (Sakat et al., 2010; Jagtap et al., 2011; Alizadeh, 2013; Vongsak et al., 2013; Sabetsarvestani et al., 2013; Shallangwa et al., 2015). The polyphenol compounds like flavonoids, phenolic acids and tannins are known to have an ideal chemical structure for effective free radical-scavenging activities that have shown to be more effective as antioxidants in vitro than vitamins E and C. This fact has been established by many researches (Apak et al., 2004; Kim and Lee, 2004). Furthermore, a number of previous studies have demonstrated a strong correlation between phenolic content, antioxidant properties and anti-inflammatory properties (Gan et al., 2010; Umaphathy et al., 2010; Sakat et al., 2010; Jagtap et al., 2011; Chandra et al., 2012a, 2012b; Shallangwa et al., 2013a, 2013b, 2015).

### Table 1: Extraction yield, total polyphenols and total flavonoids contents of extracts from Moringa oleifera and Thymus vulgaris

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Moringa oleifera</th>
<th>Thymus vulgaris</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total yield (% W/W)</td>
<td>33.59</td>
<td>23.79</td>
</tr>
<tr>
<td>Total polyphenols contents (µg GAE/mg dry extract weight)</td>
<td>8.96±2.41</td>
<td>20.86±1.66</td>
</tr>
<tr>
<td>Total flavonoids contents (µg RE/mg dry extract weight)</td>
<td>5.82±1.38</td>
<td>8.26±1.28</td>
</tr>
</tbody>
</table>

In the present study, the evaluation of anti-inflammatory effects was undertaken using the effect of Moringa oleifera and Thymus vulgaris extracts on protein denaturation. Denaturation of proteins is well documented and is caused by inflammation process, mostly in conditions like arthritis (Gan et al., 2010; Umaphathy et al., 2010; Sakat et al., 2010; Jagtap et al., 2011; Chandra et al., 2012a, 2012b; Shallangwa et al., 2013a, 2013b, 2015). Therefore, using agents that can prevent protein denaturation would be worthwhile for anti-inflammatory drug development. Several anti-inflammatory drugs have shown dose dependent ability to inhibit heat induced protein denaturation (Umaphathy et al., 2010; Sakat et al., 2010; Jagtap et al., 2011; Shallangwa et al., 2015). Protection or inhibitory effect against protein denaturation, which is the main mechanism of action of NSAIDS, plays an important role in the anti-inflammatory activity of NSAIDS (Shallangwa et al., 2013a, 2013b). The use of in vitro methods to study anti-inflammatory activities has its own advantages compared to using animals in experimental pharmacological research, because it addresses the ethical issues and the lack of rationale for the use of live animals when other suitable methods could be employed (Shallangwa et al., 2015). The ability of Moringa oleifera and Thymus vulgaris extracts to inhibit protein denaturation may contribute to their anti-inflammatory properties. In the present investigation, the in vitro anti-inflammatory effect of Moringa oleifera and Thymus vulgaris extracts, including a 1:1 blend of their extracts, were evaluated against denaturation of egg albumin. The results are as presented in Table 2.

The study showed a concentration-dependent inhibition of protein (egg albumin) denaturation by Moringa oleifera, Thymus vulgaris and the 1:1 blend of the two extracts, within the concentration ranges of 50.0 to 1600.0 µg/mL.
The reference drug, Ibuprofen, also exhibited concentration-dependent inhibition of protein denaturation. Table 2 showed that at low concentrations (50 µg/mL), the *Moringa oleifera* was more effective than the Ibuprofen standard drug, followed by *Thymus vulgaris* extract, and then the 1:1 blend of extracts. At the concentration of 100 µg/mL, the trend observed was *Moringa oleifera* > *Thymus vulgaris* > Ibuprofen > extracts blend. As the concentration increased to the range of 200-800 µg/mL, there was another slight change in the trend of percentage inhibition of denaturation: *Moringa oleifera* > *Thymus vulgaris* > extracts blend > Ibuprofen in preventing denaturation. But at higher concentration of 1600 µg/mL, another trend was observed yet, with the *Moringa oleifera* extract (507.6±2.2) showing that it is more effective than the 1:1 blend of extracts (383.3±3.0) in inhibiting denaturation of protein, followed by the *Thymus vulgaris* extract (322.6±0.8) and Ibuprofen (271.6±8.9), in that order, respectively. The study showed that within the concentration range of 200-1600 µg/mL, both extracts and their 1:1 blend were better in inhibiting protein denaturation than the reference drug, Ibuprofen.

**Table 2: Anti-inflammatory data on Thymus vulgaris**

<table>
<thead>
<tr>
<th>Concentration (µg/mL)</th>
<th><em>M. oleifera</em> (% inhibition)</th>
<th><em>T. vulgaris</em> (% inhibition)</th>
<th>1:1 blend of <em>M. oleifera</em> and <em>T. vulgaris</em> (% inhibition)</th>
<th>Ibuprofen (% inhibition)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>--</td>
<td>--</td>
<td>--</td>
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</tr>
<tr>
<td>1600</td>
<td>507.6±2.2</td>
<td>322.6±0.8</td>
<td>383.3±3.0</td>
<td>271.6±8.9</td>
</tr>
<tr>
<td>800</td>
<td>353.5±4.8</td>
<td>295.7±0.5</td>
<td>271.7±0.0</td>
<td>143.0±10.2</td>
</tr>
<tr>
<td>400</td>
<td>269.8±1.9</td>
<td>268.8±1.6</td>
<td>219.3±3.5</td>
<td>115.9±7.7</td>
</tr>
<tr>
<td>200</td>
<td>257.3±4.1</td>
<td>228.9±0.0</td>
<td>171.2±1.4</td>
<td>109.3±4.5</td>
</tr>
<tr>
<td>100</td>
<td>239.4±2.7</td>
<td>132.9±0.3</td>
<td>81.6±2.3</td>
<td>82.5±5.5</td>
</tr>
<tr>
<td>50</td>
<td>116.0±1.0</td>
<td>57.06±2.7</td>
<td>36.44±10.5</td>
<td>41.7±13.1</td>
</tr>
</tbody>
</table>

Values are expressed as SEM of 3 readings.

**Table 3: EC50 values for Moringa oleifera, H. sabdariffa, extracts blend and Ibuprofen**

<table>
<thead>
<tr>
<th></th>
<th><em>Moringa oleifera</em></th>
<th><em>Thymus vulgaris</em></th>
<th>1:1 blend of <em>M. oleifera</em> and <em>T. vulgaris</em></th>
<th>Ibuprofen</th>
</tr>
</thead>
<tbody>
<tr>
<td>IC50 (µg/mL)</td>
<td>215.9±29.8</td>
<td>144.9±1.1</td>
<td>441.6±8.6</td>
<td>1509±337</td>
</tr>
</tbody>
</table>

Values are expressed as SEM of 3 readings.

The extract concentration for 50% inhibition expressed as effective concentration (EC50) was determined by the dose-response curve using GraphPad Prism 6.01 software and values are as presented in Table 3. The EC50 is defined as the concentration sufficient to obtain 50% of a maximum inhibition of protein denaturation. In this study the EC50 values showed that the *Thymus vulgaris* extract is more effective than the *Moringa oleifera* extract, followed by the extracts blend, with the reference drug, Ibuprofen, being the least effective. The EC50 for Ibuprofen appeared to differ considerably from the rest and therefore, there was a strong motivation to characterize it as an outlier. Hence, the EC50 values in Table 3 calculated at 95% confidence level using the GraphPad Prism 6.01 software were subjected to the Dixon’s test for the rejection of grossly deviant values or outliers (Rorabacher, 1991). The statistic experimental Q-value \(Q_{exp}\) is 0.796, while critical Q-value \(Q_{crit}\) is 0.829, for \(N = 4\) at 95% confidence level (Rorabacher, 1991). Since \(Q_{exp} < Q_{crit}\), then the suspected value is accepted and retained.

**Conclusion**

One of the features of several non-steroidal anti-inflammatory drugs is their ability to inhibit or prevent denaturation of proteins has been reported by several authors. From the results of this study, it can be concluded that *Moringa oleifera* and *Thymus vulgaris*, including their 1:1 blend, possessed marked anti-inflammatory effects as they can limit the denaturation of protein process *in vitro*. The result also showed that the two extracts and their blend are better than the reference drug in preventing denaturation at higher concentrations. This can contribute to the validation of the anti-inflammatory activity of these plants and may provide some evidence for their folk uses separately and in combinations. These results also provide the motivation for further planning of clinical nutrition and anti-inflammatory research studies on bioactive compounds of the plants and development of anti-inflammatory products.

**References**


**Table 2: Anti-inflammatory data on Moringa oleifera, Thymus vulgaris, extracts blend of Moringa oleifera and Thymus vulgaris (1:1) and Ibuprofen**

**Table 3:** Anti-inflammatory Evaluation of *Moringa oleifera*, *Thymus vulgaris* and Their 1:1 Extract


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