



Neutrosophic analysis of avocado oil extraction conditions by varieties

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Abstract

Avocado oil is defined by the composition of the fruit and its nutritional value, which according to previous studies suggests that it provides health benefits, reduces cardiovascular disease, and provides anti-inflammatory and antioxidant effects. However, the nutritional value is determined by the amount of acid. Monounsaturated and polyunsaturated fatty acids make this product useful in cooking. The quality of the oil is affected by the method and conditions of extraction, as these processes affect the preservation of nutrients and beneficial properties of avocado oil. This study aimed to conduct a Neutrosophic analysis of avocado oil extraction conditions depending on the cultivar, dehydration and cold pressing conditions. As a result, the physicochemical properties of the reaction variables were determined and the values of acidity, moisture, density, and impurities were obtained for the oil obtained from the Hass variety by dehydration and pressing.

Keywords: Neutrosophic logic; oil; dehydration; pressure; productivity.

1. Introduction

Avocado is a plant from the laurel family and is common in tropical and subtropical regions. Avocado (*Persea americana*) production has increased significantly worldwide due to increased demand for the fruit, with New Zealand, Mexico, the United States, South Africa, and Chile being the main producers [1]. Due to its nutritional value, demand has increased, leading to increased interest in its production and processing.

Since it is a climacteric fruit, it needs about 5-8 days at room temperature to reach its optimal rate of ripening. In general, avocado consists of three parts: peel, pulp and seeds. The skin is rich in fiber and phenolic compounds, which have antioxidant and coloring properties. The pulp contains from 67 to 78% moisture; 13.5-24% lipids; 0.8-4.8% carbohydrates; 1.0-3.0% protein; Ash content from 0.8 to 1.5%; From 1.4 to 3.0% fiber and energy density from 140 to 228 kcal [2-3-4.] It is a fruit with a unique physicochemical composition that makes it beneficial for human health from a nutritional point of view, so high-quality monounsaturated fats, such as oleic acid, have been linked to a reduced risk of cardiovascular disease and other anti-inflammatory effects. Avocado oil, a source of antioxidants and oleic acid, is known to improve mitochondrial function, and oleic acid lowers blood pressure.] . They are also a good source of vitamins and minerals, including magnesium, potassium and vitamin E. Avocados also contain antioxidant compounds that can help prevent cell damage and reduce the risk of chronic disease. Avocado oil has a monounsaturated fat content of about 65%, while palmitoleic acid contains moderate amounts (4-13%). Palmitoleic acid has recently been shown to be a lipocin with many beneficial health effects, such as: B. Anti-inflammatory, weight and glucose reduction. A decrease in the level of triglycerides in the blood and an increase in sensitivity to insulin [6-7] .

High oleic acid oils provide excellent oxidation resistance and low-temperature fluidity for many applications.

Avocado has several technological purposes, for example, to obtain oil from the pulp, which is used in the cosmetic and food industry. Avocado oil is rich in polyunsaturated fatty acids, including omega-3 and omega-6, which have a positive effect on skin health. It has also been used in the production of oleo-structured systems, which are a healthy alternative to products high in trans fats [8].

Cold-pressed avocado oil corresponds to the trend of minimally processed products. It has been compared to olive oil for many years, primarily because of its high content of monounsaturated fatty acids (MUFAs), as well as its high content of pigments (chlorophyll and carotenoids) that act as antioxidants. Therefore, the use of avocado oil in cooking has spread throughout the world [9-10]. Extraction conditions of avocado oil depending on the variety (Hass and Fuerte), using Neutrosophic logic as an alternative method.

2. Neutrosophic logic

The user's text is "[15]". L. Zadeh introduced the concept of the fuzzy set (FS) in 1965, in which each element is assigned a degree of membership [11]. An intuitionistic fuzzy set (IFS) is characterized by a degree of non-membership $\nu_A(x) \in [0,1]$, subject to the condition that for each element x in the set X , the sum of the membership degree $\mu_A(x)$ and the non-membership degree $\nu_A(x)$ is less than or equal to 1. A significant number of individuals perceive the act of attributing a specific numerical value to an expert's judgment as excessively limiting. Instead, they opt to offer a range of values, according to the principles of imprecise probability theory. In this approach, rather than providing a precise probability, one specifies intervals of probabilities, including both upper and lower bounds. A four-value logic was suggested, incorporating truthful (T), false (F), unknown (U), and contradictory (C), with a bi-lattice structure in which the four components were interconnected [12].

Non-standard analysis started being utilized in 1995, drawing on philosophical contemplations on absolute and relative truth, as well as absolute and relative membership in logic and set theory. The name "neutrosophic" was created to symbolize the concept of neutral thinking, which draws inspiration from several contexts such as sports events, voting, numbers, and decision making. The aim is to unify these different methods.

An infinitesimal number x is defined as a number that satisfies the condition $|x| < 1/n$ for all positive values of n . A left monad ($-a$) is defined as the set of all numbers of the form $a-x$, where x is a positive infinitesimal real number. It can also be represented as $a-\varepsilon$, where ε is an infinitesimal number more than 0. Similarly, a right monad ($b+$) is defined as the set of all numbers of the form $b+x$, where x is a positive infinitesimal real number. It can also be represented as $b+\varepsilon$, where ε is an infinitesimal number greater than 0. A and b are conventional components, while ε is an unconventional component. The expression $-a * b$ is equivalent to $-(a * b)$, the expression $a * b+$ is equivalent to $(a * b)+$, the expression $-a * b+$ is equivalent to $-(a * b)+$, the expression $-a * -b$ is equivalent to $-(a * b)$ (left monads are absorbed). The expression $A + * b+$ is equivalent to $(a * b)+$ (right monads are absorbed). The symbol "*" can denote addition, subtraction, multiplication, division, or power.

S_1 and S_2 are two sets of real numbers, which may be either standard or non-standard. Addition: $S_1 \oplus S_2$ is defined as the set of all elements x such that x is equal to the sum of an element s_1 from S_1 and an element s_2 from S_2 . Subtraction: $S_1 \ominus S_2$ is the set of elements x such that x is equal to the difference between an element s_1 from set S_1 and an element s_2 from set S_2 . Multiplication: The result of multiplying two sets, S_1 and S_2 , is a new set defined as $\{x \mid x = s_1 \cdot s_2, \text{ where } s_1 \text{ is an element of } S_1 \text{ and } s_2 \text{ is an element of } S_2\}$. Partitioning a set by a non-zero divisor: Let k be a non-zero real number. Then S^k is defined as the set of all x such that x is an element of S^k , where s_1 is an element of S_1 . Let's examine the interval of non-standard units, denoted as $(-0, 1+)$, which has indistinct and ambiguous boundaries.

Let T , I , and F represent either the standard or non-standard subsets of a given set. The expression $-0, 1+ [$. Neutrosophic Logic (NL) is a logical system in which every assertion is assigned a degree of truth (T%), indeterminacy (I%), and falsity (F%). The inequality $-0 \leq \infty T + \infty I + \infty F \leq \sup T + \sup I + \sup F \leq 3+$ holds. The sets T , I , and F can be classified as either discrete or continuous intervals, which can further be categorized as open, closed, semi-open, semi-closed intervals. Additionally, these sets can also be represented as intersections or unions of other sets. Proposition P is estimated to be true between 30-40% or 45-50% of the time, uncertain 20% of the time, and false between 60% or 66-70% of the time, based on multiple analyses.

NL is an extension of Zadeh's fuzzy logic (FL), as well as Atanassov's intuitionistic fuzzy logic (IFL), and other logics. Component I, referred to as indeterminacy, can be subdivided into smaller components in order to more accurately capture ambiguous information. This allows for obtaining more exact replies in Question Answering Systems, which were first introduced by Zadeh[14]. A proposition was made to partition the "I" element into Contradiction, Uncertainty, and Unknown, so yielding a logic system consisting of five values.

Within a general Refined Neutrosophic Set, the element "T" can be subdivided into subcomponents T1, T2, ..., Tm, the element "I" into I1, I2, ..., In, and the element "F" into F1, F2, ..., Fp. This division is necessary due to the existence of different sorts of truths, indeterminacies, and falsehoods[15]. Consider Ω as a discerning frame defined by the set of elements $\Omega = \{\theta_1, \theta_2, \dots, \theta_n\}$, where n is greater than or equal to 2. The Super-Power Set (or fusion space) of Ω , denoted as $S^\wedge\Omega = (\Omega, \cup, \cap, C)$, indicates that Ω satisfies closure properties for union, intersection, and complement operations.

Traditional mass. A classical mass $m(\cdot)$ is a function $M: S^\wedge\{-\} \rightarrow [0,1]$ that satisfies the condition $\sum m(X) = 1$ for any X in $S^\wedge\Omega$. The traditional allocation of fundamental convictions (or classical mass) $m(\cdot)$ was expanded to an allocation of neutrosophic fundamental convictions (nbba) (or neutrosophic mass) $mn(\cdot)$ in the following manner: Mn is a mapping from the set $S^\wedge\Omega$ to the interval $[0,1]^3$. $Mn(A)$ is defined as $(T(A), I(A), F(A))$, where $T(A)$ represents the local probability of hypothesis A occurring, $F(A)$ represents the local likelihood of hypothesis A not occurring, and $I(A)$ represents the indeterminacy of A. The mapping Mn satisfies the requirement that the sum of $T(X)$, $I(X)$, and $F(X)$ for every X in $S^\wedge\Omega$ is equal to 1. In a broader sense, the total can be less than 1 (indicating incomplete neutrosophic information), equal to 1 (indicating complete neutrosophic information), or more than 1 (indicating paraconsistent/conflictive neutrosophic information). This article discusses a scenario in which the sum is equivalent to 1.

It is evident that the values of $T(X)$, $I(X)$, and $F(X)$ for each X in $S^\wedge\Omega$ are bounded between 0 and 1. Under the Netherlands, there are no limitations on the variables T, I, and F. However, under the International Fuzzy Logic (IFL) framework, the total value of the components (or their maximum values) must be equal to 1. As a result, the Netherlands can be used to represent incomplete information (where the sum is less than 1) and paraconsistent information (where the sum is greater than 1). In philosophy, NL has the ability to differentiate between absolute truth ($NL(\text{absolute truth}) = 1+$) and relative truth ($NL(\text{relative truth}) = 1$). However, IFL lacks this capability. Absolute truth is defined as being true in all conceivable worlds according to Leibniz, while relative truth is just required to be true in at least one world. In the Netherlands, it is permissible for components to deviate from standard specifications, although in the International Financial Reporting Standards (IFRS), non-standard components are not allowed. Natural Language (NL), similar to dialectics, has the ability to accommodate paradoxes. In NL, paradoxes can be represented as $NL(\text{paradox}) = (1, I, 1)$. However, in Ideal Formal Language (IFL), paradoxes cannot be handled in the same way.

If we simplify the components to scalar numbers t, i, f, where $t + i + f = n$, NL can be applied to various types of logic: - Boolean logic (when $n = 1$ and $i = 0$, with t and f being either 0 or 1); - multi-valued logic (when $n = 1$, $i = 0$, and $0 \leq t, f \leq 1$); - intuitionistic logic (when $0 < n < 1$, $i = 0$, and $0 \leq t, f < 1$); - fuzzy logic (when $n = 1$ and $i = 0$, and $0 \leq t, f \leq 1$); - intuitionistic fuzzy logic (when $n = 1$); - paraconsistent logic (when $n > 1$, $i = 0$, and $0 < t, f < 1$); - dialectics (when $t = f = 1$ and $i = 0$); - fallacy (when $i > 0$).

Neutrosophic logical operators, also known as connectors, can be defined in various ways based on the specific requirements of applications or problem-solving scenarios [16]. Let's examine a 3D Cartesian coordinate system, where t represents the truth axis with a value range greater than -0.1, i represents the false axis with a value range greater than -0.1, and f represents the indeterminate axis with a value range greater than -0.1.

The neutrosophic technical cube ABCDEFGH is now partitioned into three non-overlapping regions:

The equilateral triangle BDE, with side lengths equal to $\sqrt{2}$, represents the set of points where the sum of the coordinates equals 1. In intuitionistic fuzzy logic (A-IFS), if a point Q lies on the sides of triangle BDE or within it, then the sum of t_Q , i_Q , and f_Q is equal to 1.

The pyramid EABD, which is situated to the right of the triangle EBD, consists of the base ABD and the side faces EBA and EDA. However, the face BDE is not included. This pyramid represents the set of points whose total coordinates are fewer than 1.

The solid EFGCDEBD, omitting triangle BDE, is located on the left side of triangle BDE on the cube. This solid consists of points whose coordinates have a sum higher than 1, similar to a paraconsistent set.

The Neutrosophic Cube serves as a geometric representation of the Neutrosophic Set, providing further insight into its nature and properties. It is possible to get a total of coordinates that is either less than 1 or larger than 1, without being equal to 1.

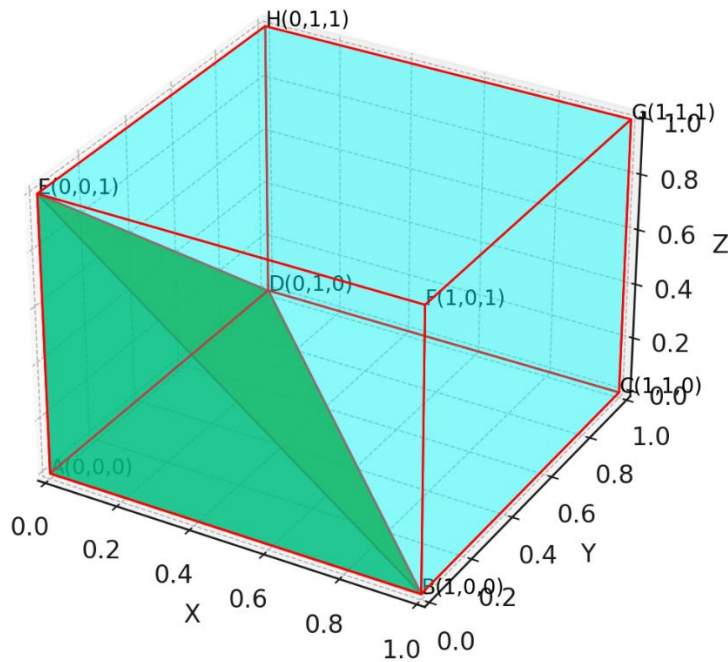


Figure 1: Neutrosophic Cube

The source can determine the degree of membership for an element, but it lacks the ability to determine the degree of non-membership. Another source that can only determine the extent to which an element is not a member. Alternatively, a source that exclusively computes indeterminacy. Therefore, when we combine the results from these sources, it is conceivable that their total may not be exactly 1, but instead could be either less or greater.

In information fusion, when working with indeterminate models, such as intersections or complements of elements that are unknown due to insufficient information, it is important to calculate the belief, non-belief, and indeterminacy of these elements. The sum of these three components is always less than 1, indicating the presence of missing information.

A and B are two sets within the universe U [17]. An element x with neutrosophic membership belonging to A is denoted as $x(T1, I1, F1)$, while an element x with neutrosophic membership belonging to B is denoted as $x(T2, I2, F2)$. NS operators, which are analogous to NL connections, can be defined in several ways.

NS does not impose any limitations on the variables T, I, and F. However, in IFS, the total value of the components (or their maximum values) must equal 1. As a result, NS can be used to describe situations with incomplete information (where the sum is less than 1) and paraconsistent information (where the sum is more than 1). Neuro-symbolic (NS) systems may differentiate between absolute membership ($NS(\text{absolute membership}) = 1+$) and relative membership ($NS(\text{relative membership}) = 1$) in philosophy, however Integrated Function Systems (IFS) lack this capability. Absolute membership refers to being a member in every conceivable universe, while relative membership refers to being a member in at least one world. Within the context of NS (Non-standard analysis), it is possible for components to deviate from the standard, however in IFS (Iterated Function Systems), this is not allowed. Neuro-symbolic (NS), similar to dialect (although there may be some contradictions), has the ability to manage paradoxes. In NS, the paradox element is represented as $(1, I, 1)$. On the other hand, in IFS, it lacks this capability. NS operators can be defined in relation to T, I, and F, whereas IFS operators are only defined in relation to T and F.

The application of Neutrosophic logic to agriculture represents a significant advance in solving problems related to food production.

In agricultural decision-making, Neutrosophic logic allows one to consider multiple scenarios and assess their likelihood, taking into account uncertainties associated with factors such as climate, pests, and farming practices. This allows farmers to make strategic and informed decisions, minimizing risks and maximizing profits.

In addition, Neutrosophic logic is useful in agricultural risk management to assess and mitigate risks associated with unpredictable events such as droughts, floods or epidemics. By recognizing unknown factors, farmers can develop more effective and adaptive risk management strategies.

In agricultural research, a Neutrosophic logic promotes an interdisciplinary approach that integrates diverse perspectives and methodologies, which can lead to innovative discoveries and practical solutions to current agricultural problems.

Applying Neutrosophic logic to agriculture thus provides a powerful and flexible conceptual framework for dealing with complexity and uncertainty in food production, thereby contributing to the sustainability and efficiency of food production.

Neutrosophic logic emerges as an innovative and powerful tool in assessing quality in agriculture, offering a flexible and adaptable approach to address the inherent uncertainty and ambiguity in this field. In an agricultural environment, where factors such as variable climatic conditions, crop diversity, and interaction with the environment can influence outcomes, neutrosophic logic provides a framework to analyze and understand quality more comprehensively and accurately.

The ability of neutrosophic logic to handle uncertainty translates into a more robust evaluation of quality in agriculture. For example, when considering crop quality, factors such as variability in yield due to unpredictable weather conditions or the presence of diseases can create uncertainty in traditional assessment. Neutrosophic logic enables capturing this uncertainty and providing a more precise evaluation that takes into account both positive and negative aspects.

Furthermore, neutrosophic logic offers the necessary flexibility to adapt to the multifaceted nature of quality in agriculture. Agricultural quality is not limited solely to crop performance but also includes aspects such as environmental sustainability, food safety, and resource efficiency. Neutrosophic logic allows for the integration of multiple dimensions of quality into a holistic evaluation, providing a more comprehensive view of the situation and facilitating informed decision-making.

Moreover, neutrosophic logic's ability to handle ambiguity makes it a valuable tool for evaluating quality in agriculture, where data interpretation can be subjective and variable. For instance, when assessing the sensory quality of agricultural products, different individuals may have different perceptions, leading to ambiguity in evaluation. Neutrosophic logic enables capturing this ambiguity and providing a more precise evaluation that reflects the diversity of opinions and perceptions.

In conclusion, neutrosophic logic offers a solid and adaptable framework for evaluating quality in agriculture, effectively addressing the inherent uncertainty and ambiguity in this field. Its ability to handle multiple dimensions of quality and its flexibility to adapt to different situations make it an invaluable tool for farmers, researchers, and decision-makers in the agricultural sector. By integrating neutrosophic logic into quality assessment processes, we can improve the accuracy and relevance of our decisions, thereby contributing to continuous improvement and sustainability in agriculture.

2 Material and Methods

Hass avocados were harvested 8 days before planting in Sigchos State, Cotopaxi Province. The fruits are uniform in size, have no mechanical damage and are stored at room temperature until ready for processing. . at the agricultural factory of the Polytechnic University of Cotopaxi and the company Extractor Quevepalma SA.

Analytical determinations of avocado oil are performed to analyze factors such as acidity, moisture, density, and impurities according to standardized methods (Association of Official Analytical Chemists (AOAC) and American Petrochemical Society (AOCS) Official Method).

Physicochemical analyses were performed on avocado oil for processing with improved extraction conditions and characteristics (iodine index, peroxide index, refractive index, density and fatty acid composition).

To develop a Neutrosophic framework for evaluating the conditions of avocado oil production, a preliminary analysis of what this means for farmers is required, based on a collective hermeneutic process in a specific context. Essentially, the methods of document analysis, semi-structured interviews, focus groups, and theoretical models based on proven agricultural experience were deliberately chosen to build the Neutrosophic System.

In the quantitative part, methods and tools of Neutrosophic logic were used, taking into account the opinions of farmers (recognized experts). Using the conclusions of experts, an adhesion function was created to evaluate the operating conditions of the oil. For this, expert methods and critical evaluations are used, i.e. tools that allow you to evaluate the opinions of different experts on a certain topic. until 10 o'clock].

Expertise consists of collecting expert opinions on the subject of study and then establishing global values, which are grouped into a data set containing all values according to expert criteria for each Neutrosophic type. In this particular case, based on the opinions of experts (during focus groups and interviews), the following categories emerged: extremely negative (EM), moderately negative (MM), average (M), good (B) and appearance. Bona (EB), which will be presented in detail later [11].

Once the variations of each type have been established empirically, the anti-expert procedure is best applied to experts rather than initial participants. It ends with a table of relative frequencies called Expert on, which is used to redefine the boundaries of each category, useful for reducing the range of meanings of linguistic terms and improving the quality of features (more).

Based on the obtained results, a decision-making process takes place - a cognitive process by which the best option is selected from among many alternatives based on certain criteria. The consideration of attitude assessment in the attitude component and the selection of strategies, methods and tools to be used in this regard is an individual decision-making process in which each farmer decides, as part of the exchange of knowledge, what his crop should do in the future [12].] .

To analyze the implementation situation, this process becomes a collective decision-making process in the farmers' council. This analysis is conducted among several farmers to share knowledge with individual farmers, which is a very subjective process. Since these processes are highly subjective, they are considered uncertain, ambiguous, or uncertain in nature, so it is convenient to use a Neutrosophic logic for a group decision [18].

The final classification of each element is achieved by applying Neutrosophic logic. For this, the maximum values belonging to the Neutrosophic type are calculated for simplicity without losing the accuracy of the current uncertainty estimate. This method applies the Neutrosophic component of the criterion weight vector (W), equation 1, to the membership matrix (C).

The operator returns the maximum value of the Neutrosophic value. After the y value was obtained using the proposed method, the deneutrosophization process was carried out, which is nothing more than the transformation of the Neutrosophic value into the corresponding imaginary value [19 , 20, 21].

3 Result

Extraction of avocado oil is a complex process that requires special conditions to ensure the quality of the final product. Here are five basic conditions for this process:

1. The ripeness of the avocado: to obtain high-quality avocado oil, it is necessary to choose the ideal level of ripeness. This guarantees a sufficient content of oil in the fruits and helps to improve the organoleptic properties of the oil.
2. Extraction temperature: The temperature during the extraction process is important to preserve the nutritional and organoleptic properties of avocado oil. To prevent the decomposition of heat-sensitive compounds, it is necessary to maintain a controlled temperature, usually between 45°C and 50°C.
3. Extraction method: There are different methods of extracting avocado oil, such as cold pressing or solvent extraction. The method chosen can affect the quality and yield of the oil, as well as the nutritional composition and bioactive compounds of the oil.

4. Refining Process: After the initial pressing, avocado oil may go through a refining process to remove impurities and increase its stability. This process includes degumming, Neutrosophicization, bleaching and deodorization and must be carried out carefully so as not to degrade the quality of the oil.

5. Storage and Packaging: After extraction and purification, avocado oil should be stored in an airtight container and protected from light and heat to prevent oxidation and spoilage. Packaging in inert conditions and the use of antioxidants extend the life of the oil and preserve its quality.

Which uses Neutrosophic logic to evaluate avocado oil extraction conditions. During its creation, expert procedures and counter-assessments were taken into account.

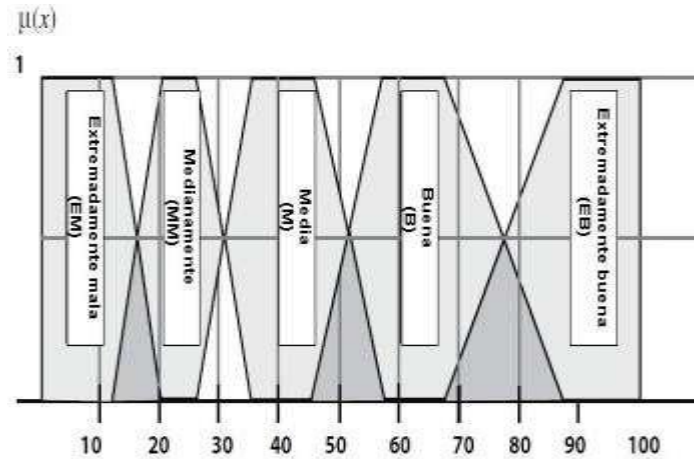


Figure 2: Neutrosophic assessment of avocado oil extraction conditions.

Given these results, the Neutrosophic nature of the scale becomes apparent when Neutrosophic logic is applied to the triangular regions where the continuous (darker) categories overlap, suggesting that there is uncertainty in the cutoff values. The horizontal axis shows the quality range of hundred points by which each extraction condition is evaluated.

To calculate the importance of these conditions in avocado oil production using neutrosophic logic, we will first assign values to the truth (T), indeterminacy (I), and falsehood (F) components for each condition. Then, we will combine these values using logical operations to determine the overall importance of each condition. Here is the process for each condition:

1. Avocado ripeness:

- Truth (T): 0.8 (high quality when the ideal ripeness level is chosen)
- Indeterminacy (I): 0.1 (some uncertainty about the choice of ripeness level)
- Falsehood (F): 0.1 (low quality if the appropriate ripeness level is not chosen)
- Formula: $T + I - F = 0.8 + 0.1 - 0.1 = 0.8$

2. Extraction temperature:

- Truth (T): 0.7 (high quality if the temperature is maintained between 45°C and 50°C)
- Indeterminacy (I): 0.2 (some uncertainty about the optimal temperature range)
- Falsehood (F): 0.1 (low quality if the temperature exceeds or does not reach the appropriate range)

- Formula: $T + I - F = 0.7 + 0.2 - 0.1 = 0.8$

3. Extraction method:

- Truth (T): 0.75 (high quality if an appropriate extraction method is used)
- Indeterminacy (I): 0.15 (uncertainty about which method is most suitable)
- Falsehood (F): 0.1 (low quality if an inappropriate method is chosen)
- Formula: $T + I - F = 0.75 + 0.15 - 0.1 = 0.8$

4. Refining process:

- Truth (T): 0.8 (high quality if an adequate refining process is carried out)
- Indeterminacy (I): 0.1 (some uncertainty about the effectiveness of the refining process)
- Falsehood (F): 0.1 (low quality if an inadequate refining process is performed)
- Formula: $T + I - F = 0.8 + 0.1 - 0.1 = 0.8$

5. Storage and packaging:

- Truth (T): 0.85 (high quality if stored and packaged properly)
- Indeterminacy (I): 0.1 (some uncertainty about storage and packaging conditions)
- Falsehood (F): 0.05 (low quality if not stored and packaged properly)
- Formula: $T + I - F = 0.85 + 0.1 - 0.05 = 0.9$

After performing these calculations for each condition, we can see that all have a positive value and are above 0.5, indicating that all are important for ensuring the quality of avocado oil. However, storage and packaging appear to be the most important condition, closely followed by avocado ripeness and the refining process.

Table 1: Production conditions evaluation

Extraction condition	Quality range
The ripeness of the avocado	80
Extraction temperature	80
Extraction method	80
Refining Process	80
Storage and Packaging	90

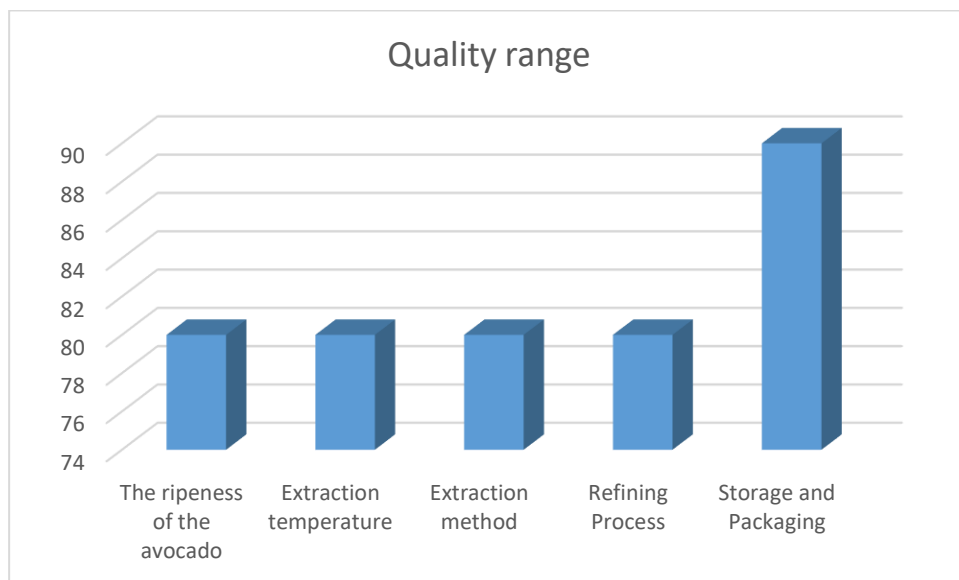


Figure 3: Production conditions evaluation

The mean type (M) in the context of the analysis of conditions for the production of avocado oil assigns the characteristic of agreement on the created attitude scale concerning the language scale (0.60, 0.35, 0, 40), which indicates that the setting item is meaningful on the linguistic scale [8] "Moderately Good" (MDB), a component achieved with lower requirements than other components evaluated under avocado oil extraction conditions.

The analysis using the mean type (M) to assess avocado oil production conditions shows a significant weighting of the attitude scale created in relation to the linguistic scale. This assignment of agreement, with specific values (0.60, 0.35, 0.40), suggests a certain coherence in the perception of the production process quality, with the final outcome classified as "Moderately Good" (MDB). This finding highlights the importance of considering not only the technical and quantitative aspects but also the subjective and qualitative perceptions in quality evaluation.

The assignment of the label "Moderately Good" (MDB) to this component highlights a generally positive perception of the avocado oil production process, albeit not without areas for improvement. This evaluation suggests that, despite meeting certain acceptable standards, there is still room to optimize and refine the process to achieve higher levels of quality. It is essential to recognize this evaluation as a starting point for continuous improvement in avocado oil production.

Comparing this evaluated component with other aspects of the avocado oil extraction process reveals that it achieves its "Moderately Good" rating with lower requirements compared to other components. This can be interpreted as a positive sign of efficiency and effectiveness in certain aspects of the process, but it may also indicate possible areas of neglect or lack of attention in other critical aspects of the production process.

In summary, the analysis of the mean type in this context provides valuable insight into avocado oil production conditions by considering both quantitative and qualitative aspects. It underscores the importance of integrating subjective perceptions in quality evaluation and points out specific areas that could benefit from greater attention and improvement. This holistic approach to evaluation could be crucial in driving quality and efficiency in the avocado oil industry.

4 Conclusion

This study delves into the application of Neutrosophics within the context of avocado oil extraction conditions, particularly focusing on the characteristics of avocado oil production in Ecuador. By analyzing various aspects of the production process, including the ripening of avocados and the composition of the purification process, the study highlights the significance of these factors in determining the overall quality of the extracted oil. It is evident that

the purification process achieves a moderately good level (MDB), indicating that certain components meet quality standards with relatively lower requirements compared to other evaluated factors.

Furthermore, the quality assessment of avocado oil extraction involves monitoring various physicochemical properties such as acidity, moisture, density, impurities, and oxidation resistance, among others. The study reveals that optimal extraction conditions for Hass avocados involve a dehydration process at 65°C for 10 hours followed by cold extraction at 250 bar for 3 minutes. While most physicochemical properties meet established standards, it is crucial to note that the fatty acid composition exceeds control values, emphasizing the importance of preserving product quality during both the dehydration process and extraction conditions. In conclusion, while the physicochemical properties of the extracted avocado oil generally align with established standards, careful consideration must be given to maintain the optimal fatty acid composition to ensure the overall quality and health benefits of the product. This study provides valuable insights into refining extraction processes to meet quality standards and underscores the importance of ongoing research and development in optimizing avocado oil production for both domestic and international markets.

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