CODEX ALIMENTARIUS COMMISSION

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Food and Agriculture Organization of the United Nations

World Health Organization

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Agenda Item 7.2

CX/FO 21/27/8 Part II
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JOINT FAO/WHO FOOD STANDARDS PROGRAMME

CODEX COMMITTEE ON FATS AND OILS

Twenty-Seventh Session

Virtual, 18 – 22 October 2021 and 26 October 2021

PROPOSALS FOR NEW WORK

(Replies to CL 2019/54-FO)

PART II – PROPOSED AMENDMENT/REVISION TO THE CODEX STANDARD FOR NAMED VEGETABLE OILS (CXS 210-1999), - INCLUSION OF MAHUA OIL

DISCUSSION PAPER

(Submitted by India)

Codex Members and Observers wishing to submit comments, on the **project document for new work on the inclusion of mahua oil in CXS 210-1999 (Appendix 1)**, should do so as instructed in CL 2021/36/OCS-FICS available on the Codex webpage/Circular Letters 2021:http://www.fao.org/fao-who-codexalimentarius/resources/circular-letters/en/

INTRODUCTION

1. Madhucalatifolia or Madhucaindica commonly called as Mahua belongs to family *sapotaceae*and finds origin in different regions of India, Sri Lanka, Myanmar and Nepal. The two major species of the genus *Madhuca* (sapotaceae) found in India are *Madhucaindica (synonyms - Bassialatifolia, Madhucalatifolia)* and *Madhucalongifolia (synonyms – Bassialongifolia).* Both the species are closely related and hence no distinction is made in the trade. There is, though, some potential confusion because one of the alternative names for Mahua butter is Illipe. Mahua is also popularly and globally referred as Indian Illipe (very similar to Illipe butter - Borneo tallow found in Malaysia). The fat is, though, from a completely different species from *Shoreastenoptera*that is normally associated with illipe butter.
2. *Mahua* is one of the naturally occurring plants, which possess numerous health benefits especially the Mahua flowers. It is a multipurpose tree, which fulfills three fundamental needs of tribal individuals i.e. Food, Fodder and Fuel. Flower juice is supplemented to lactating women for augmentation of breast milk. *Mahua* is a frost resistant species that can grow in marginal areas of dry tropical and subtropical forests up to an altitude of 1200-1800 m, in India. It requires mean annual temperature of 2-46 degC, mean annual rainfall ranging from 550-1500 mm and mean annual humidity from 40-90 %. Mahua trees are distributed from India to other Asian countries like The Philippines, Pakistan, Sri Lanka to Australia.
3. The orange brown berry (2.5-5.0 cm long) contains 1-4 shining seeds. Drying and decortication yield kernels (70% by wt). The yield of mahua seeds varies (5-200 kg/tree) depending upon size and age of the tree. The average yield of sun-dried mahua seeds is about 1.6 kg/tree. Mahua tree starts giving seeds after 10 years and it goes up to 60 years.

BENEFITS OF MAHUA FAT

4. The Mahua seed gives significant yield of fat (50-60%), wherein the fat seems to be a good source of essential fatty acids and lipid-soluble bioactives. The high oleic and linoleic acid content makes the fat nutritionally valuable. Tocopherols and phytosterols at the level estimated may be of nutritional importance in the application of the fat. The higher antiradical potential of mahua butter indicates that mahua butter is a potent source of antioxidant compounds, which reflects on its oxidative stability and its nutritional value. It is anticipated that Mahua butter will gain higher popularity because; (1) it has distinct flavor, yellow color and stability without a need for hydrogenation, (2) it has high percentage of unsaturated fatty acids, including 16.5 % PUFA as linoleic acid and about 37.4 % MUFA as oleic acids, and (3) the fat is both desirable and inexpensive as a raw material. The high levels of oleic and stearic acids in the triglyceride composition approaches that of cocoa butter, therefore, it shows very high compatibility and may be utilized as a preferred fat for producing chocolates and confectionery products. It could also be used in the

production of bakery fat, shortenings, and margarine, after suitable modifications. Furthermore, Mahua butter may also be involved in many dairy products such as cheese, ice cream, coffee cream and whipping cream. The seeds are thus valuable in meeting demands for food and food supplements with functional, health-promoting properties in addition to industrial uses.

MAHUA FAT AS COCOA BUTTER EQUIVALENT (CBE) INGREDIENT

5. The main fatty acids found in the Mahua Fat are palmitic, stearic, oleic and linoleic acid. The minor lipid composition is also good owing to its phytosterol and tocopherol components.
6. The Mahua oil is rich in PUFA and has desirable level of oleic and stearic acid to be used as cocoa substitute in confectionary products and production of margarines. Cocoa Butter equivalents (CBE) are generally blends of fats or fat fractions predominantly composed of symmetrical glycerides like POP (palmitic acid -oleic acid- palmitic acid), POSt (palmitic acid -oleic acid-stearic acid) or StOSt (stearic acid -oleic acid- stearic acid) type. Mahua contains 26% of the symmetrical triglycerides (SOS type) and can be enriched by fractionation (dry or solvent). On fractionation, the Mahua stearin has triglyceride structure very similar to cocoa butter and it is rich in both POP and POS triglycerides and thus becomes an ideal non-palm-based CBE ingredient.
7. The kernels contain 50% oil and the yield is 34-37%. The fat is roughly 40–45% saturated and 55–60% unsaturated.
8. Mahua oil/ fat availability in India is around 20000 – 25000 MT / Annum and during a good crop season based on the seed collection, it can be even more.
9. Codex standard for Chocolate and chocolate products (CXS 87-1981) also allows addition of 5% vegetable fat other than cocoa butter in the products covered by the standard. Most of the countries use Cocoa Butter Equivalents in the manufacture of chocolates.
10. There is a strong need for the commercial utilization of this fat as an additional CBE ingredient to bridge the gap between demand and supply of cocoa butter globally. At present only 6 CBE ingredients like Sal, Mango, Kokum, Shea, Illipe and Palm Oil have been used globally. Inclusion of Mahua Fat into the Codex Standard for Named Vegetable Oils will provide an additional option/resource ingredient to the Industry for its possible uses as CBE ingredient and to facilitate global trade. Moreover, the multi-purpose use and the value-added products from Mahua tree borne seed oils/fats will play an important role for the sustainable development of tribal economy and their wellness.

RECOMMENDATION

11. The Codex Committee on Fats and Oils is invited to: consider the proposal for new work on Mahua oil (Appendix I); and make suitable recommendation to the Codex Alimentarius Commission for approval as new work. Proposed revision is presented as Annex.

APPENDIX I

PART II –PROPOSED AMENDMENT/REVISION OF THE STANDARD FOR NAMED VEGETABLE OILS (CXS 210-1999) – INCLUSION OF MAHUA OIL

PROJECT DOCUMENT

1. PURPOSE AND SCOPE OF THE STANDARD

The purpose of this new work is to amend the Codex Standard for Named Vegetable Oils (CXS 210-1999) in order to include MAHUA oil, with a view to adopting appropriate measures, which contribute to the facilitation of legitimate trade. The inclusion of the food safety and quality standards of this oil in Codex Stan 210 on vegetable oils will enable the establishment of standards to monitor the food safety of this product, facilitate conditions for its commercialization and serve as a frame of reference for the establishment of technical standards on edible fats and oils of this oil which is an ideal non-palm based CBE ingredient.

2. RELEVANCE AND TIMELINESS

New sustainable edible oil sources are desired to achieve supply chain flexibility and cost saving opportunities. Non-traditional fruit seeds are being considered because their constituents have unique chemical properties and may augment the supply of nutritional and functional products.

Madhuca longifolia Syn. M. indica (Sapotaceae) is an important economic tree and Mahua fatty acid composition is similar to palm oil, cocoa butter and shea fat. The Mahua oil is rich in PUFA and has desirable level of oleic and stearic acid to be used as cocoa substitute in confectionary products and production of margarines. Mahua contains 26% of the symmetrical triglycerides (SOS type) and can be enriched by fractionation (dry or solvent). On fractionation, the Mahua stearin has triglyceride structure very similar to cocoa butter and it is rich in both POP and POS triglycerides and thus becomes an ideal non-palm-based CBE ingredient. Due to its favorable characteristics, this oil can be utilized in increased amounts, it is important for it to have consistent naming and specifications to ensure fair trade internationally. The proposed work also falls well within the TORs of the committee, i.e. *to elaborate worldwide standards for fats and oils of animal, vegetable and marine origin including margarine and olive oil.*

Consideration of an amendment to the Standard for named vegetable oils, to include Mahua oil would require relatively little time and would make efficient use of limited CCFO resources since the major factor affected is fatty acid composition.

3. MAIN ASPECTS TO BE COVERED

The proposed new work on inclusion of Mahua Oil in the Standard for Named vegetable oils (210-1999) will be developed according to existing procedures for Codex standards and will include, but not be limited to, the following:

- Description
- Essential composition and quality factors

  (Table 1: GLC ranges of fatty acid composition)
- Other quality and compositional factors

  Table 2: Chemical and physical characteristics

  Table 3: Sterols composition

  Table 4: Levels of tocopherols and tocotrienols

ASSESSMENT AGAINST THE CRITERIA FOR THE ESTABLISHMENT OF WORK PRIORITIES;

This proposal is consistent with the Criteria for the Establishment of Work Priorities applicable to both commodities and general subjects.

a. Volume of production and consumption in individual countries and volume and pattern of trade between countries.

Madhucalatifolia or Madhucaindica commonly called as Mahua belongs to family *sapotaceae*and finds origin in different regions of India, Sri Lanka, Myanmar and Nepal.

Mahua trees are distributed from India to other Asian countries like the Philippines, Pakistan, Sri Lanka to Australia.

Mahua oil/ fat availability in India is around 20000 – 25000 MT / Annum and during a good crop season based on the seed collection, it can be even more.

b. Diversification of national legislations and apparent resultant or potential impediments to international trade.

It is necessary to develop an international standard for Mahua oil, to prevent technical barriers to international trade, and as a means of protecting the consumer health and guaranteeing fair trade.

The standards of Mahua oil are prescribed under the Indian- Food Safety and Standards Regulations (Food Products Standards and Food Additives) Regulation, 2011, which specifies definition, along with quality parameters of the oil. It is also allowed to be used as a Cocoa butter equivalent in chocolate manufacture. Bureau of Indian Standards has also specified Indian Standard, IS 545:1984, Specifications for Manhua Oil.

The proposed amendment to the Codex Standard for Named Vegetable Oils (CXS 210 - 1999) will facilitate global trade of Mahua oil. Without such a standard, it is expected that national legislations will differ, which will adversely affect international trade in this product.

c. International or regional market potential

As indicated above, a significant international and regional market potential exists, especially when new sustainable edible oil sources are desired to achieve supply chain flexibility and cost saving opportunities.

d. Amenability of the commodity to standardization.

This is a proposed amendment to the Codex Standard for Named Vegetable Oils (CXS 210-1999) to include Mahua oil is readily amenable to inclusion in that standard; much the same as other oils that are already in the standard.

The characteristics that determine the commercial quality of Mahua oil, for example, the definition, classification by fatty acid composition and quality parameters etc. are amenable to standardization.

e. Coverage of the main consumer protection and trade issues by existing or proposed general standards.

As such, there is no product standard that could serve as a reference for trade quality requirements among the standards developed by the Codex Alimentarius. Development of a Codex standard for Mahua oil will enhance consumer protection by discouraging deceptive practices and the development of private standards.

f. Number of commodities, which would need separate standards indicating whether raw, semi-processed or processed.

The proposal is to develop a single standard for Mahua oil (within Standard for Named vegetable oil) will cover its all traded forms worldwide.

g. Work already undertaken by other international organizations in this field and/or suggested by the relevant international intergovernmental body(ies).

- The International Organization for Standardization (ISO) has a general standard for Oilseeds, vegetable oils and fats, which includes Mahua oil.

  ISO 5507:2002 Oilseeds, vegetable oils and fats — Nomenclature

4. RELEVANCE TO THE CODEX STRATEGIC OBJECTIVES

The development of standard for Mahua oil is in line with the strategic objective to promote the maximum application of codex standards by countries in their national legislation and to facilitate international trade by protecting health of the consumers. This proposal is in line with the following objectives of Codex Strategic Plan 2020-2025:

(i) Goal 1 ***Address current, emerging and critical issues in a timely manner***, Objective 1.1 and 1.2: *Identify and prioritize needs and emerging issues of member countries.*

(ii) Goal 4: ***Facilitate the participation of all Codex Members throughout the standard setting process***

Objective 4.2: *Increase sustainable and active participation of all Codex Members*

5. INFORMATION ON THE RELATION BETWEEN THE PROPOSAL AND OTHER EXISTING CODEX DOCUMENTS AS WELL AS OTHER ONGOING WORK

There is no existing Codex product standard for Mahua oil, the proposal is to amend the Standard for Named Vegetable oils to include specifications of Mahua oil. The horizontal rules on food safety drafted by the Codex general subject committees relevant to vegetable oils, will usually apply.

6. IDENTIFICATION OF ANY REQUIREMENT FOR AND AVAILABILITY OF EXPERT SCIENTIFIC ADVICE

None identified as such. Experts on Mahua oil will take part via national delegations or observer organizations in Codex.

7. IDENTIFICATION OF ANY NEED FOR TECHNICAL INPUT TO THE STANDARD FROM EXTERNAL BODIES SO THAT THIS CAN BE PLANNED FOR

None foreseen at this stage. If necessary, the relevant organizations may take part in the development of the standard through their status as Codex observers.

8. THE PROPOSED TIMELINE FOR COMPLETION OF THE NEW WORK

SESSION	STEP PROCEDURE
CCFO27 (2021)	Consideration of Project document/new work and establishment of eWG
CAC44 (2021)	Approval of new work/project document
CCFO28 (2023)	Consideration of comments at Step 4
CAC46 (2023)	Adoption of amendments at step 5/8

REFERENCES

1. MadhucaIndica: A Review of its Medicinal Property (Patel et al., IJPSR, 2012; Vol. 3(5))
2. Mahua an important Indian species: A review (Vinita Bisht et al., Journal of Pharmacognosy and Phytochemistry 2018; 7(2): 3414-3418))
3. *Mahua*: A Boon for Pharmacy and Food Industry – Pinakin et al *Curr. Res. Nutr Food Sci Jour.,* Vol. 6(2) 371-381 (2018)
4. Mahua (*Madhucaindica*) seed oil: A source of renewable energy in India- Journal of Scientific & Industrial

APPENDIX II

PROPOSED DRAFT REVISION TO THE STANDARD FOR NAMED VEGETABLE OILS (CODEX STAN 210-1999): FOR INCLUSION OF MAHUA OIL

1. DESCRIPTION

MAHUA OIL means the oil expressed from clean and sound seeds or nuts of Madhuca (Bassilatifolia, Madhucalatifolia or Bassilongifolia, Madhucalongifolia or a mixture of both). It can be subjected to process of refining and/or fractionation and/or esterification and/or hydrogenation.

2. ESSENTIAL COMPOSITION AND QUALITY FACTORS

2.1 GLC ranges of fatty acid composition (expressed as percentages)

Table1- fatty acid composition of Mahua Oil (expressed as percentage of total fatty acids) (1)

Fatty Acid	Proposed FAC for CODEX
C6:0	ND
C8:0	ND-0.2
C10:0	ND-0.1
C12:0	ND-0.2
C14:0	0-0.3
C16:0	16 – 28.2
C16:1	ND-0.2
C18:0	14 – 29.9(2)
C18:1	36.3 – 50(3)
C18:2	8 – 15.8(2)
C 18:3	ND-0.2
C 20:0	ND-0.2
C20:1	ND
C20:2	ND
C22:0	ND
C22:1	ND
C22:2	ND
C24:0	ND
C24:1	ND
C18:1 t	ND
C18:2 t + C18:3 t	ND

ND - Non-detectable, defined as ≤ 0.05%

OTHER QUALITY AND COMPOSITION FACTORS

1. QUALITY CHARACTERISTICS

CHEMICAL AND PHYSICAL CHARACTERISTICS

Chemical and Physical Characteristics are given in Table 2.

The oil shall be refined and shall conform to the following standards:

Table 2

Butyro-Refractometer Reading at 40°C OR	49.5 to 52.7
Refractive Index at 40°C	1.4590-1.4611
Saponification value	187 to 196
Iodine value	58 to 70
Unsaponifiable matter	Not more than 2.0 per cent.
Acid value	Not more than 0.5
Moisture and volatile matter %	Not more than 0.1%
Peroxide Value	Not more than 10

2. IDENTITY CHARACTERISTICS

2.1 Table 3: **Sterol composition for Mahua oil**

- Sterol composition (%)[(1)]

Sterol	**Proposed value**
Cholesterol	ND
Brassicasterol	ND
Campesterol	16 max
Stigmasterol	7 max
Beta-sitosterol	70 max
Delta-5-avenasterol	6 max
Delta-7-stigmastenol	1 max
Others	ND
Total sterols (mg/kg)	550

2.2 Levels of tocopherols and tocotrienols and total tocopherols are given in Table 4

Table 4: Levels of tocopherols and tocotrienols[(4)]

oil	Alpha-tocopherol	Beta-tocopherol	Gamma-tocopherol	Delta-tocopherol	Alpha-tocotrienol	Gamma-tocotrienol	Delta-tocotrienol	Total (mg/kg)
Mahua Oil	38	189	1741	-	-	-	-	

3. METHODS OF ANALYSIS AND SAMPLING

Determination of moisture and volatile matter at 105°C

According to ISO 662: 1998.

Determination of insoluble impurities

According to ISO 663: 2000.

Determination of refractive index

According to ISO 6320: 2000; or AOCS Cc 7-25 (02)

Determination of saponification value (SV)

According to ISO 3657: 2002; or AOCS Cd 3-25 (03)

Determination of iodine value (IV)

Wijs - ISO 3961: 1996; or AOAC 993.20; or AOCS Cd 1d-1992 (97); or NMKL 39(2003)

The method to be used for specific named vegetable oils is stipulated in the Standard

Determination of unsaponifiable matter

According to ISO 3596: 2000; or ISO 18609: 2000; or AOCS Ca 6b-53 (01)

Determination of peroxide value (PV)

According to AOCS Cd 8b-90 (03); or ISO 3960: 2001

Determination of acidity

According to ISO 660: 1996, amended 2003; or AOCS Cd 3d-63 (03)

Determination of sterol content

According to ISO 12228: 1999; or AOCS Ch 6-91 (97)

Determination of tocopherol content

According to ISO 9936: 1997; or AOCS Ce 8-89 (97)

References

1. Physical and Chemical Characteristics of Oils, Fats and Waxes, 3rd edition – David Firestone, AOCS PRESS (Illipe Butter - pg 104-105)
2. Non-Traditional Oilseeds and oils in India – N.V Bringi (Pg 59)
3. https://seaofindia.com/coco-butter-equivalents-from-vegetable-fats/
4. Functional characteristics, nutritional value and industrial applications of Madhucalongifolia seeds: an overview (Ramadan, et al, J Food SciTechnol (May 2016) 53(5):2149–2157)