Walnut Quality Technical Standards

Chilean Walnut Commission ChWC

Export requirements for:

- In-shell walnuts
- Shelled walnuts (hand cracked)
- Shelled walnuts (machine cracked)
INTRODUCTION

Chilean Walnut Commission (ChWC), the association which gathers processors and exporters of walnuts in Chile, has as its main objective the promotion of Chilean walnuts quality. For this purpose ChWC developed quality standards for member or candidate companies.

The content presented in this Standard will be a useful tool for all sectors especially for export companies and also for clients, who will be able to have access through this standard to a homogeneous quality product in compliance with international quality parameters standards.

There are some Standards listed bellow:

- Technical Standard for in-shell walnuts
- Technical Standard for shelled walnuts (hand-cracked)
- Technical Standard for shelled walnuts (machine cracked)
TECHNICAL STANDARD FOR IN-SHELL WALNUTS

1 SCOPE AND FIELD OF APPLICATION

This standard defines the quality requirements for in-shell walnuts commercialization by Chilean Walnut Commission members.

2 TERMS AND DEFINITIONS

The following terms and definitions are used for the purpose of this standard:

2.1 Walnut: Fresh fruit (of dry nature) belonging to the species *Juglans regia* that once it is ripe, the pericarp (hull) has been removed, becoming covered with the firm and rough endocarp (shell); it is divided into two halves which hold the edible kernel of characteristic flavor.

2.2 Size: Limit values of the equatorial diameter that define walnut sizes expressed in millimeters.

2.3 Pericarp (hull): Woody shell external cover of soft consistency that shows signs of turning green to brown color.

2.4 Kernel: Edible part of the walnut encased in the hard shell.

2.5 External defects: Any damage or abnormality that affects the walnut appearance.
The following characteristics are considered external defects:

2.5.1 **Open shell:** Shell that is partially separated in the suture line which is noticeable without pressing the fruit.

2.5.2 **Slight stains:** Alterations consisting in a black, brown, reddish brown, gray or other color in pronounced contrast with the background color of the shell which in total represent between 10% up to 20% of the shell surface.

2.5.3 **Imperfect shell:** Anomalous development of some shell sections that resemble abrasions or erosions that usually show small perforations. It is considered a defect when the affected surface either alone or added up with the rest, is more than 1 cm².

2.5.4 **Cracked walnut:** Fruit which shows a fractured shell, without any missing parts.

2.5.5 **Broken walnut:** Fruit where there is a part of the shell missing, in a surface diameter greater than or equal to 6 mm.

2.5.6 **Split Walnut:** Fruit that shows the two halves separated.

2.5.7 **Serious stains:** Alterations consisting in a black, brown, reddish brown, gray or other color in pronounced contrast with the background color of the shell which in total represent over 20% of the shell.

2.5.8 **Adhering hull presence:** Existence of hull over the hard shell; it is considered a defect when it affects more than 10 % of the shell surface.

2.6 **Internal defects:** Any damage or abnormality that affects the walnut appearance.

The following characteristics are considered internal defects:

2.6.1 **Slight shriveling:** Walnut in which the kernel shows at a glance a certain degree of dryness or dehydration to an extent that affects more than 12.5% and less than 25% of its surface, including both halves, altering its condition as a result of wrinkling.

2.6.2 **Inactive fungus:** Fungal presence of dry aspect and moldy characteristic, visible at first sight.

2.6.3 **Insects damage:** Presence of dead insects, no matter their living stage, within the nut. Visible and noticeable damage produced by insects or insect traces (webs, feces).
2.6.4 **Serious shriveling:** Walnut whose kernel shows at a glance a serious shriveling greater than or equal to 25% of its surface- including both halves.

2.6.5 **Empty nuts:** Nuts without endosperm (edible part) in their kernels.

2.6.6 **Rancidity:** Kernel alteration due to its oil decomposition affecting its organoleptic properties. It is considered rancid having a free acidity content expressed as oleic acid of not more than 1 g /100 g of nut oil (1%).

*NOTE 1* - Rancidity should *not* be confused with a slightly astringent flavor of the kernel skin of a recently harvested nut, in which the flavor is bland after the drying process.

*NOTE 2* - If there are doubts concerning rancidity after a sensory analysis, a free acidity content analysis must be performed.

2.6.7 **Active fungus, indication of decay:** Visible presence in vegetative forms of diverse fungi that affects the kernel, producing humid decomposition of its tissues.

2.7 **Walnut color:** Defined by Chilean Walnut Commission color chart (Annex 1).

*NOTE:* The best conditions to use the color chart are with an illuminance of 1000 lux or more over the evaluation surface provided by daylight fluorescent tubes.

2.8 **Primary package:** Protection that holds the product directly.

2.9 **Secondary package:** Protection that holds one or more primary packages.

3 **CLASSIFICATION**

3.1 **According to quality requirements, walnuts are classified in the following categories:**

   a.- Extra Category
   b.- Category I
   c.- Category II
   d.- Sub-standard

3.2 *In-shell* walnuts of a certain category must comply with all requirements of that category.
3.3 In-shell walnuts unable to comply with some requirements of a certain category must be classified in a lower one, provided they fulfill all the requirements of that category. Walnuts that do not satisfy all the mentioned conditions established in this standard are considered as sub-standard.

3.4 Sub-standard in-shell walnuts can be commercialized as such, according to requirements established by parties, fulfilled all health requirements referred in clause 4 of this standard.

4 GENERAL REQUIREMENTS

4.1 The moisture weighted average in the sample of in-shell walnuts (shell/kernel set) must be ≤ 8% on a wet basis.

4.2 The moisture weighted average in the kernel sample must be ≤ 5% on a wet basis.

4.3 Walnuts shells must present a uniform color as established in this standard and the color must be characteristic of the variety.

4.4 Walnuts kernels must have a firm and brittle not flexible texture.

4.5 Walnuts must be virtually free of earth and other foreign materials -whether attached or released- and also free of living insects.

4.6 The content of each package must be uniform containing only in-shell walnuts of the same origin, crop year, quality and size. In a single package stated to contain a given variety, a defined mixture of varieties or commercial type will be accepted, with a maximum of 10 % by number or weight of in-shell walnuts belonging to other varieties or commercial types.

4.7 Tolerances concerning allowed pesticide residues must comply with local authorities and target markets requirements, along with health requirements established by competent Authority.

4.8 Each processing plant must have a health permit issued by the Health Authorities (SEREMI, by its acronym in Chile) and a Safety Management System based on the HACCP principles whose scope must be mentioned and specified for every walnut process stage. Current certification must be provided by an accredited entity.

NOTE: HACCP certification in walnut processing plants and “cracking” centers will be compulsory as of 2013. Companies must take all necessary measures in order to put into practice the demanded certification over the year 2013.
5 QUALITY REQUIREMENTS

5.1 Size

Nuts should have uniform size, according to sizes set up in Table 1. For all categories, a maximum of 10% of in-shell walnuts deviating from the minimum size stated on the labeling is accepted, including 4% of walnuts of immediate lower size mentioned above.

Unsized category: Categories of various sizes processed and selected in processing plants.

Table 1. Size requirements.

<table>
<thead>
<tr>
<th>Trade name, size</th>
<th>Equatorial diameter (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;26</td>
<td>&lt;26</td>
</tr>
<tr>
<td>(26-28)</td>
<td>≥26</td>
</tr>
<tr>
<td>(28-30)</td>
<td>≥28</td>
</tr>
<tr>
<td>(30-32)</td>
<td>≥30</td>
</tr>
<tr>
<td>(32-34)</td>
<td>≥32</td>
</tr>
<tr>
<td>(34-36)</td>
<td>≥34</td>
</tr>
<tr>
<td>(+34)</td>
<td>≥34</td>
</tr>
<tr>
<td>(+36)</td>
<td>≥36</td>
</tr>
<tr>
<td>Unsized</td>
<td>-</td>
</tr>
</tbody>
</table>

NOTE 1 - Sizes (+34 and +36) are referential due to the fact that they are the most used in the food industry.

NOTE 2 - Size measurement should be done when putting the nut on a caliper gauge without putting pressure on it.

NOTE 3 - Thickness of caliper gauges should be the same as those used by the caliper gauge tray in the processing plant.
5.2 Defects

Walnuts should not exceed defect tolerances displayed in Table 2.

Table 2. Defects tolerance according to categories (in percentage).

<table>
<thead>
<tr>
<th>External Defects</th>
<th>Extra Category</th>
<th>Category I</th>
<th>Category II</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Open shell</td>
<td>7</td>
<td>10</td>
<td>15</td>
</tr>
<tr>
<td>2. Slight stains</td>
<td>7</td>
<td>9</td>
<td>12</td>
</tr>
<tr>
<td>3. Imperfect shell</td>
<td>7</td>
<td>8</td>
<td>10</td>
</tr>
<tr>
<td>4. Cracked walnut</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Broken walnut</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Split walnut</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Serious stains</td>
<td>5</td>
<td>7</td>
<td>8</td>
</tr>
<tr>
<td>8. Adhering hull</td>
<td>3</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>Total external defects</td>
<td>10</td>
<td>10</td>
<td>15</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Internal Defects</th>
<th>Extra Category</th>
<th>Category I</th>
<th>Category II</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Slight shriveling:</td>
<td>10</td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td>2. Inactive fungus:</td>
<td>6</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>3. Serious shriveling</td>
<td>6</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>4. Empty nuts</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Insect damage</td>
<td>5</td>
<td>5</td>
<td>7</td>
</tr>
<tr>
<td>6. Rancidity</td>
<td>2</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>7. Active fungus; indication of decay</td>
<td>1</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Total internal defects</td>
<td>10</td>
<td>15</td>
<td>15</td>
</tr>
</tbody>
</table>

5.3 Color

According to color chart, kernels color can be extra light, light, light amber, amber and/or yellow (Annex 1).

Tolerance and color requirements according to category are shown in Table 3.

NOTE- If the parties so provide, colors can also be defined, in an informative way, by their trade name: extra light, light, light amber and amber, respectively.
Table 3. Color tolerances for in-shell walnuts.

<table>
<thead>
<tr>
<th>Color</th>
<th>Extra Category</th>
<th>Category I</th>
<th>Category II</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extra light and light %*</td>
<td>≥50</td>
<td>≥30</td>
<td>≥20</td>
</tr>
<tr>
<td>Yellow %*</td>
<td>≤ 10</td>
<td>≤ 20</td>
<td>≤ 40</td>
</tr>
<tr>
<td>Amber %*</td>
<td>≤ 10</td>
<td>≤ 20</td>
<td>≤ 30</td>
</tr>
</tbody>
</table>

(*) Extra light, light, amber and yellow colors, according to Chilean Walnut Commission color chart (Annex 1).

6 PRIMARY PACKAGES

6.1 Packaging materials and containers used for in-shell walnuts should be new, clean, free of contaminants, technically adequate and of a quality such as to provide suitable protection during storage, handling and transportation.

6.2 Packages must be made of suitable materials to avoid providing foreign odors or flavors.

6.3 Annex 3 of this manual contains relevant technical information regarding proper use of packages and utensils.

6.4 Container must have firm tags or printed signs with the following information as a minimum:

   a) Product name/variety: In-shell nut/Walnut variety
   b) Category: Extra, I, II
   c) Size: According to Table 1
   d) Net weight: Expressed in kilograms
   e) Country of origin of the product
   f) Crop year
   g) Name or company name and exporter address
   h) Code mark or processing plant name
   i) Number and date of Health Service resolution involved in authorizing the plant operation.
   j) Date of packaging: Day (by means of two digits); month (by means of two digits or first three letters of the month); year (by means of last two digits)
k) Storage recommendations and consumption period

6.5 Information mentioned in the item above should be written in Spanish; if the product is for export, the language is specified by the customer.

6.6 Information contained in each package must enable traceability at any stage of the process; see annex 4 (Identification and traceability).

7 MOISTURE CONTENT

7.1 In order to determine walnuts moisture content, a designed and adjusted instrument can be used, as long as the instrument has been validated certified by the description within the standard.

7.2 Validation will be carried out by comparing and correcting the measurements of the instrument with the results of dry material analysis made by an accredited laboratory or by the company itself, as described in Annex 5 of this manual.

7.3 This process must be performed at least once a month.

8 NET WEIGHT

8.1 In an individual package, net weight must comply with the tolerance established in Table 4.

8.2 The average net weight of the sample in a packaging lot must be greater than or equal to the declared net weight.

8.3 Weighing shall be undertaken at the end of the packaging line and 3 units per pallet as a minimum shall be recorded, being a package (bag, box, etc) the sampling unit.
Table 4. Tolerances for individual values of net weight.

<table>
<thead>
<tr>
<th>Declared net weight (g or ml)</th>
<th>Negative deviation allowed in % of declared net weight</th>
<th>in g or ml</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 to 50</td>
<td>9</td>
<td>4.5</td>
</tr>
<tr>
<td>50 to 100</td>
<td>4.5</td>
<td></td>
</tr>
<tr>
<td>100 to 200</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>200 to 300</td>
<td>1.5</td>
<td></td>
</tr>
<tr>
<td>300 to 500</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>500 to 1000</td>
<td>1.5</td>
<td></td>
</tr>
<tr>
<td>1000 to 10000</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>more than 15000</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

9 SAMPLING PROCEDURE AND QUALITY CONTROL

9.1 Each lot to be sampled must consist, where possible, of produce of a single type, degree, category, size and composition, manufactured under uniform conditions and at the same time.

9.2 Selected produce for sampling must be extracted from the lot at random.

9.3 However, when the lot includes sub-lots or strata, qualified by a certain criterion, stratified sampling must be used as the sampling method in such a way that the size of the sub-sample of each sub-lot is proportionate to the size of such sub-lot or stratum. Thus, the sample must be fairly representative of the whole lot.

9.4 A sample is a portion of nuts extracted from a package in a uniform way from a specific pallet.

9.5 By gathering samples from different packages of the same pallet, a representative composite sample for this pallet is obtained.

9.6 To carry out the packaging products analysis:

   a.- At the time of palletizing, 3 packages from the same pallet must be probability selected and subjected to an internal quality control in every plant.

   b.- 100 walnuts of each selected package will be analyzed, according to the parameters established by the technical standard.
9.7 To carry out the analysis during the process:

a. Samples shall be permanently extracted and analyzed in all production lines.

b. A sample of 100 walnuts as a minimum per hour in every picking line shall be taken.

9.8 There must be a daily detailed registration of all measurements performed by quality controls.
TECHNICAL STANDARD FOR SHELLED WALNUTS (HAND CRACKED)

1 SCOPE AND APPLICATION FIELD

This standard establishes quality requirements that shelled walnuts (hand-cracked) should perform for its commercialization by Chilean Walnut Commission members.

2 TERMS AND DEFINITIONS

For the purpose of this standard, the following terms and definitions are used:

2.1 Shelled walnut: Kernel of an edible nut of the Juglans regia species, in which the shell and the septum or woody membrane have been removed.

2.2 Shell: Nut endocarp; woody shell external cover or any fragment of it.

2.3 Septum: Woody tissue, compartment or membrane that divides the kernel into two cotyledons or two similar halves.

2.4 Kernel: Edible part of the nut encased in the shell.

2.5 Slight defects: Any damage or abnormality that affects the kernel appearance.
The following characteristics are considered slight defects:

2.5.1 Slight stains: Areas in pronounced contrast with the kernel background color and that fail to meet the commercial colors¹ affecting more than 12.5% and less than 25% of its surface.

1) Commercial colors according to Color Chart in Annex 1 of Chilean Walnut Commission.

2.5.2 Slight shriveling: Walnut which shows at a glance a certain degree of dehydration (wrinkling) to an extent which affects more than 12.5% and less than 25% of its surface.

2.6 Damages and serious defects: Any abnormality that seriously affects kernel appearance or quality.

The following characteristics are considered damages and serious defects:

2.6.1 Serious stains: Areas in pronounced contrast with the kernel background color and do not match characteristic colors, affecting more than 25% of its surface, alone or combined.

2.6.2 Serious shriveling: Nut that shows a visible dehydration (wrinkling), which is greater or equal than 25% of its surface.

2.6.3 Inactive fungus or mold: Fungal presence which includes white to gray mycelia of dry appearance, detectable at a glance.

2.6.4 Insect damage: Presence of dead insects (whatever their stage of development), insect traces (webs, feces) and/or noticeable damage produced by them.

2.6.5 Active fungus or indication of decay: Visible presence of diverse fungi vegetative forms that affect the kernel, producing humid decomposition of its tissues.

2.6.6 Impurities: Vegetable matter debris belonging to a nut but not edible, such as hull, shell or septum debris, etc.

2.6.7 Foreign matter: Material that is not usually associated with the vegetable matter of a walnut; visible and inedible such as sand, dust, stones, metallic particles, glass and others.

2.7 Halves: Kernel halves, including the ones that have up to 12.5% (1/8) of the kernel missing, providing that the kernel maintains its characteristic form (see reference image).
2.8 **Quarters or large pieces:** Kernel piece held by a sieve of 13mm and that is smaller than a half of a kernel.

2.9 **Pieces or medium pieces:** Kernel pieces which shall pass through a 13 mm sieve and cannot pass through 9 mm sieve.

2.10 **Rancidity:** Kernel alteration owing to its oil decomposition affecting its organoleptic properties. It is considered rancid when having a free acidity content expressed as oleic acid of not more than 1 g /100 g of nut oil.

   **NOTE 1:** Rancidity should not be confused with a slightly astringent flavor of the kernel skin of a recently harvested nut, in which the flavor is bland after the drying process.

   **NOTE 2:** If there are doubts concerning rancidity after a sensory analysis, a free acidity content analysis must be performed.

2.11 **Industrial walnut:** Mixture of kernels from different colors and sizes, in which slight defects are predominant but not exceeding 15% of serious defects.

2.12 **Discarded walnut:** Kernel parts in which serious defects are predominant, not exceeding 15% of the total inedible kernel.

2.13 **Walnut color:** Defined in Chilean Walnut Commission color chart (Annex 1).

   **NOTE:** The best conditions to use the color chart are with an illuminance of 1000 lux or more over the evaluation surface provided by daylight fluorescent tubes.

2.14 **Color mixture:** It will be defined as such when the immediate darkest color does not exceed 70% of the total weight.

2.15 **Variety mixture:** It will be defined as the combination of presentations; for example, when kernel halves and pieces are combined, with an indication of the proportion of each type.

2.16 **Primary package:** Protection that contains the product directly.

2.17 **Secondary package:** Protection that holds one or more primary packages.
3 CLASSIFICATION

3.1 According to presentation, shelled walnuts are classified into the following styles:

   a. - Halves
   b. - Halves and pieces
   c. - Quarters and large pieces
   d. - Pieces or medium pieces

   NOTE: They can be classified in other size ranges, as long as it is specified in the label.

3.2 Regarding color, shelled walnuts are classified in the following categories:

   a. - Extra light
   b. - Light
   c. - Light amber
   d. - Amber
   e. - Yellow

   NOTE: They can be classified in other color ranges, as long as it is specified in the label.

4 GENERAL REQUIREMENTS

4.1 Walnuts should have the following characteristics:

   a. - Moisture content: ≤ 5% (on a wet basis or fresh weight).
   b. - Characteristic flavor and aroma of the variety.
   c. - Firm and brittle texture, not flexible.

4.2 Shelled walnuts must fulfill pesticide residue tolerances established in domestic, international or destination country regulations, as appropriate.
4.3 Each processing plant must have a health permit granted by proper health SEREMI (by its acronym in Chile) and a HACCP Safety Management System whose scope must be mentioned and specified for every walnut processing stages. Health certification must be issued by an accredited entity.

**NOTE:** HACCP certification in walnut processing plants and "cracking” centers will be mandatory as of 2013; during the course of 2012 companies should take appropriate measures in order to implement the required certification.

## 5 QUALITY REQUIREMENTS

### 5.1 Presentation

Shelled walnuts must comply with tolerances shown in Table 1.

<table>
<thead>
<tr>
<th>Type</th>
<th>Halves</th>
<th>Quarters</th>
<th>Pieces</th>
</tr>
</thead>
<tbody>
<tr>
<td>Halves</td>
<td>≥ 90%</td>
<td>&lt;10%</td>
<td></td>
</tr>
<tr>
<td>Halves and pieces</td>
<td>&gt; 20 and &lt; 90 (specify proportion in label)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Quarters</td>
<td>≥ 75%</td>
<td>&lt; 25%</td>
<td></td>
</tr>
<tr>
<td>Pieces</td>
<td></td>
<td>≥ 75%</td>
<td></td>
</tr>
</tbody>
</table>

### 5.2 Defects

Halves, quarters and pieces must comply with defect tolerances for the corresponding category, according to Tables 2a and 2b.
Table 2a. Defect tolerances (maximum percentage in weight).

<table>
<thead>
<tr>
<th></th>
<th>Halves</th>
<th>Quarters</th>
<th>Pieces</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Slight Shriving</td>
<td>4</td>
<td>6</td>
<td>9</td>
</tr>
<tr>
<td>2. Slight stains</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Serious stains</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Serious shrinking</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Inactive fungus</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Insect damage</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Rancidity</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>8. Active fungus, decay</td>
<td>0.2</td>
<td>0.5</td>
<td>1</td>
</tr>
</tbody>
</table>

**Total defects**: 4 6 9

*NOTE: For presentation mixtures, weigh tolerances regarding their proportion specified on the label should be weigh.*

Table 2b. Impurities and foreign matter tolerances.

<table>
<thead>
<tr>
<th></th>
<th>Halves</th>
<th>Quarters</th>
<th>Pieces</th>
<th>Mixtures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Impurities</td>
<td></td>
<td></td>
<td></td>
<td>0,02% (2 gr per 10 kg box)</td>
</tr>
<tr>
<td>Foreign matter</td>
<td>0 units</td>
<td>0 units</td>
<td>0 units</td>
<td>0 units</td>
</tr>
</tbody>
</table>
5.3 Color

Tolerances concerning halves and quarters color for all categories are set up in Table 3.

Table 3. Color tolerances for shelled walnuts (excluding industrial and discarded walnuts) (maximum percentage by mass).

<table>
<thead>
<tr>
<th>Color</th>
<th>Extra light</th>
<th>Light</th>
<th>Light amber</th>
<th>Amber</th>
<th>Yellow</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extra light</td>
<td>≥ 85%</td>
<td>&lt; 15%</td>
<td>≥ 85%</td>
<td>0%</td>
<td>5% included in 15%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>&lt; 15%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Light</td>
<td>&lt; 15%</td>
<td>≥ 85%</td>
<td>≤ 2% included in previous 15%</td>
<td>0%</td>
<td>10% included in 15%</td>
</tr>
<tr>
<td>Light amber</td>
<td>≥ 85%</td>
<td>&lt; 15%</td>
<td>≥ 85%</td>
<td>0%</td>
<td>5% included in 15%</td>
</tr>
<tr>
<td>Amber</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>≥ 90%</td>
</tr>
<tr>
<td>Yellow</td>
<td>&lt; 20%</td>
<td></td>
<td>≤ 2% (included in 20%)</td>
<td></td>
<td>≥ 80%</td>
</tr>
</tbody>
</table>

Remarks: Color mixtures can be made, but they must be specified on the label.

6 PRIMARY PACKAGES

6.1 The materials and packages used on shelled walnuts must be new, clean, free of contaminants, technically suitable and of a quality that provide proper protection during storage, handling and transportation.

6.2 Packages must be manufactured of suitable materials to protect produce from the oxidative oxygen action. Besides, they should avoid giving inappropriate odors or flavors to produce.

6.3 Since shelled walnuts are products with low moisture content and, consequently, of a highly hygroscopic nature, packages must protect them from moisture to avoid alterations.

6.4 Shelled walnuts are packed in plastic bags (co-extruded) or in another package capable of containing modified atmosphere, meaning that 98% of oxygen (O₂) is extracted when packaging, in order to avoid oxidation process within the walnut.
6.5 Annex 3 shows relevant technical information regarding correct use of packages and utensils.

7 SECONDARY PACKAGE

7.1 Packaged product must be stored in corrugated cardboard or in another material to protect it during storage, handling and transportation.

7.2 The container should have firm labels or printed signs with the following information as a minimum:

a) **Product name**: Shelled walnuts (hand cracked).

b) **Type**: Halves, quarters, pieces, etc.

c) **Color**: According to annex 1.

d) **Net weight**: in kilograms.

e) **Company name or exporter name and address**.

f) **Country of origin of the product**.

   Note: In either domestic or imported products, imported walnuts which have undergone processing or modified their physical, chemical, biological, or organoleptic properties must be considered as of domestic origin for marking purposes (Article 107, d).

g) **Number and date of Health Service resolution that grants plant’s operation permission**.

h) **Date of packaging**: Day (by means of two digits); month (by means of two digits or the first three letters of the month); year (by means of the last two digits).

i) **Crop year**.

j) **Code mark or processing plant name**.

k) **Storage recommendations and consumption period**.

l) **Number of packages per container and net weight of each package**.

7.3 Information mentioned in the item above must be written in Spanish; if the product is for export, the language should be specified by the destination country.
7.4 Information displayed in each package must allow traceability at any stage of the process; see annex 4 (Identification and traceability).

8 MOISTURE CONTENT

8.1 To determine walnuts moisture content, a specially designed and adjusted instrument shall be used, as long as the instrument is certified according this standard description.

8.2 Determination will be carried out by comparing and correcting the instrument measurements with the dry matter analysis results approved by an accredited laboratory or by the company itself, as described in Annex 5 of this manual.

8.3 This process must be performed at least once a month.

9 NET WEIGHT

9.1 In an individual package, net weight must fulfill the tolerance set up in table 4.

9.2 The average net weight of the sample in a package constituting a lot must be greater than or equal to the declared net weight.

9.3 Weighing process will be performed at the end of the packaging line and the weight of 3 units per pallet as a minimum will be registered; being a package (bag, box, etc) the sampling unit.

Table 4 - Tolerances for individual values of net weight

<table>
<thead>
<tr>
<th>Declared Net Weight, nw in g or ml</th>
<th>Negative deviation allowed in nw %</th>
<th>in g or ml</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 to 50</td>
<td>9</td>
<td>4.5</td>
</tr>
<tr>
<td>50 to 100</td>
<td>4.5</td>
<td>9</td>
</tr>
<tr>
<td>100 to 200</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>200 to 300</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>300 to 500</td>
<td></td>
<td></td>
</tr>
<tr>
<td>500 to 1000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1000 to 10000</td>
<td>1.5</td>
<td>150</td>
</tr>
<tr>
<td>10000 to 15000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>more than 15000</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>
10 SAMPLING PROCEDURE

10.1 Each sampling lot must consist, as long as possible, of a same type, degree, category, size and composition products, manufactured under uniform conditions and essentially at the same time.

10.2 Products selected for sampling must be chosen from the lot at random.

10.3 However, when the lot consists of sub-lots or strata, identified by a certain criterion, a stratified sampling must be used so that the size of the sub-sample of each sub-lot is proportional to the size of this sub-lot or stratum. Thus, the sample must be fairly representative of the whole lot.

10.4 Sample is a portion of walnuts evenly chosen from a package belonging to a specific pallet.

10.5 A uniform composite and representative sample is obtained by gathering samples from different packages of a same pallet.

10.6 To analyze packaged products:

   a.- At the time of palletizing, 3 packages from the same pallet should be probability selected; which must be subjected to an internal quality control in each plant.

   b.- To analyze each sample, 1000 gr of walnuts will be probability selected from each sampled package.

10.7 For the analysis during the process:

   a.- Samples must be permanently taken and analyzed in all production lines.

   b.- Sampling must be taken every hour as a minimum.

10.8 There must be a daily detailed registration of all measurements performed by quality controls.
TECHNICAL STANDARD FOR -SHELLED WALNUTS (MACHINE CRACKED)

1.- SCOPE AND APPLICATION FIELD

This standard sets up quality requirements for -shelled walnuts (machine cracked) for their commercialization by Chilean Walnut Commission members.

2.- TERMS AND DEFINITIONS

For the purpose of this standard, the following terms and definitions are used:

2.1 Shelled walnut: Kernel belonging to an edible nut of *Juglans regia* species, in which the shell and the septum or woody membrane are removed.

2.2 Shell: Fruit endocarp and it represents the woody shell external cover or any fragment of it.

2.3 Septum: Woody tissue, compartment or membrane that divides the kernel into two cotyledons or two similar halves.

2.4 Kernel: Edible part of the walnut contained by the shell.

2.5 Slight defects: Any damage or abnormality that affects the kernel appearance.
The following characteristics are considered slight defects:

2.5.1 Slight stains: Areas in pronounced contrast with the background color of the kernel and that fail to meet the commercial colors affecting more than 12.5% and less than 25% of its surface.

Commercial colors according to Chilean Walnut Commission. color chart in Annex 1.

2.5.2 Slight shriveling: Walnut which shows at a glance a certain degree of dehydration (wrinkling) to an extent which affects more than 12.5% and less than 25% of its surface.

2.6 Damages and serious defects: Any abnormality that seriously affects the appearance or quality of the kernels.

The following characteristics are considered damages and serious defects:

2.6.1 Serious stains: Areas in pronounced contrast with the background color of the kernels that do not match characteristic colors, affecting more than 25% of its surface, alone or combined.

2.6.2 Serious shriveling: Nut that shows dehydration (wrinkling) visible to the naked eye, which is greater or equal than 25% of its surface.

2.6.3 Inactive fungus or mold: Fungal presence which includes white to gray mycelia on the kernel of dry appearance, visible to the naked eye.

2.6.4 Insect damage: Presence of dead insects (whatever their stage of development), traces (webs, feces, etc) and/or noticeable damage produced by them.

2.6.5 Active fungus or indication of decay: Visible presence at a glance of diverse fungi vegetative forms that affects the kernel, producing wet decomposition of its tissues.

2.6.6 Impurities: Vegetable specific nut matter debris which is inedible, such as hull debris, shell or septum, etc.

2.6.7 Foreign matters: Alien material that is not associated with nut vegetable nature; visible and inedible such as sand, dust, stones, metallic particles, glass or others.

2.7 Halves: Kernel halves, including the ones that have up to 12.5% (1/8) of the kernel missing, as long as the kernel keeps its characteristic form (see reference image).
2.8 **Quarters or large pieces:** Kernel piece held by a sieve of 13mm and that is smaller than a half of a kernel.

2.9 **Pieces or medium pieces:** Kernel pieces which shall pass through a 13 mm diameter sieve and cannot pass through a 9 mm diameter sieve.

2.10 **6 to 9 pieces or small pieces:** Kernel pieces which shall pass through a 9 mm diameter sieve and cannot pass through a 6.0 mm diameter sieve.

2.11 **3 to 6 pieces:** Kernel piece which shall pass through a 6 mm diameter sieve and cannot pass through a 3.0 mm diameter sieve.

2.12 **Nut flour:** Ground kernels which shall pass through a 3 mm diameter sieve.

2.13 **Rancidity:** Kernel alteration owing to its oil decomposition affecting its organoleptic properties. It is considered rancid when having a free acidity content expressed as oleic acid of not more than 1 g /100 g of nut oil.

   *NOTE 1-* Rancidity should not be confused with a slightly astringent flavor of the kernel skin of a recently harvested nut in which the flavor is bland after the drying process.

   *NOTE 2-* If there are doubts concerning rancidity after a sensory analysis, a free acidity content analysis must be performed.

2.14 **Industrial walnut:** Mixture of kernels from different colors and sizes, in which slight defects are predominant but not exceeding 15% of serious defects.

2.15 **Discarded nut:** Kernel parts in which serious defects are predominant, but not exceeding 15% of the inedible kernel.

2.16 **Walnut color:** Defined in Chilean Walnut Commission color chart (Annex 1).

   *NOTE:* The best conditions to use the color chart are with an illuminance of 1000 lux or more over the evaluation surface provided by daylight fluorescent tubes.

2.17 **Color mixture:** It will be defined as such when the immediate darkest color does not exceed 70% of the total weight.

2.18 **Mixture of varieties:** The combination of presentations; for example, when kernel halves and pieces are combined but an indication of each proportion should be done.

2.19 **Primary package:** protection that contains the product directly.

2.20 **Secondary package:** protection that holds one or more primary packages.
3 CLASSIFICATION

3.1 According to its presentation, shelled walnuts are classified in the following categories:

   a. - Halves
   b. - Quarters or large pieces
   c. - Pieces or medium pieces
   d. - 6 to 9 mm pieces or small pieces
   e. - 3 to 6 mm pieces
   f. - Nut flour

   NOTE: They can be classified in other size ranges, as long as it is specified in the marking.

3.2 Regarding color, shelled walnuts are classified in the following categories:

   a. - Extra light
   b. - Light
   c. - Light amber
   d. - Amber
   e. - Yellow

   NOTE: They can be classified in other color ranges, as long as it is specified in the marking.

4 GENERAL REQUIREMENTS

4.1 Walnuts should have the following characteristics:

   a. - Moisture content: ≤ 5% (on a wet basis o fresh weight).
   b. - Characteristic flavor and aroma of the variety.
   c. - Firm and brittle texture, not flexible.

4.2 Shelled Walnuts must fulfill pesticide residue tolerances set up in domestic, international or destination country regulations, as appropriate.
4.3 Each processing plant must have a health permit granted by proper health SEREMI (by its acronym in Chile) and a HACCP Safety Management System whose scope must be mentioned and specified for every walnut processing stage. Health certification must be issued by an accredited entity.

**NOTE:** HACCP certification in walnut processing plants and "cracking" centers will be mandatory as of 2013.

### 5 QUALITY REQUIREMENTS

#### 5.1 Presentation

Shelled walnuts must comply with tolerances indicated in Table 1.

Table 1. Tolerances for shelled walnuts (maximum percentage by mass).

<table>
<thead>
<tr>
<th>Type</th>
<th>Halves</th>
<th>Quarters</th>
<th>Pieces</th>
<th>3 to 9 pieces</th>
<th>3 to 6 pieces</th>
<th>Nut flour</th>
</tr>
</thead>
<tbody>
<tr>
<td>Halves</td>
<td>≥ 90%</td>
<td>&lt;10%</td>
<td>≤3 %</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Halves and pieces</td>
<td>&gt; 20 and &lt; 90 (specify proportion in marketing)</td>
<td>≥ 11%</td>
<td>≤7% (included in Quarters and Pieces tolerance)</td>
<td>≤3% (included in 6-9 Pieces tolerance)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Quarters</td>
<td>≥ 75%</td>
<td>&lt; 25%</td>
<td>≤7%</td>
<td>≤3% (included in 6-9 Pieces tolerance)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pieces</td>
<td>≥ 75%</td>
<td>&lt; 25%</td>
<td>≤7%</td>
<td>≤3% (included in 3-6 Pieces tolerance)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 to 9 pieces</td>
<td>≥ 75%</td>
<td>&lt; 25%</td>
<td>≤3%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 to 6 pieces</td>
<td>≥ 95%</td>
<td>≤5%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
5.2 Defects

Halves, quarters and pieces must comply with defect tolerances for the corresponding category, according to Table 2a and 2b.

Table 2a. Tolerances for Defects (maximum percentage by mass).

<table>
<thead>
<tr>
<th>1. Slight Shrveling</th>
<th>Halves</th>
<th>Quarters</th>
<th>Pieces</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Slight stains</td>
<td>4</td>
<td>6</td>
<td>9</td>
</tr>
<tr>
<td>3. Serious stains</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Serious shrveling</td>
<td>2</td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>5. Inactive fungus</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Insect damage</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>7. Rancidity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Active fungus, decay</td>
<td>0.2</td>
<td>0.5</td>
<td>1</td>
</tr>
</tbody>
</table>

**Total defects:** 4 6 9

Table 2b. Impurities and foreign matter tolerance.

<table>
<thead>
<tr>
<th></th>
<th>Halves</th>
<th>Quarters</th>
<th>Pieces</th>
<th>Mixtures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Impurities</td>
<td></td>
<td>0,02%</td>
<td>2 gr per 10 kg box</td>
<td></td>
</tr>
<tr>
<td>Foreign matter</td>
<td>0 units</td>
<td>0 units</td>
<td>0 units</td>
<td>0 units</td>
</tr>
</tbody>
</table>
5.3 Color

Tolerances concerning halves and quarters color for all categories are set up in Table 3.

Table 3. Color tolerances for shelled Walnuts (excluding industrial and discarded walnuts (maximum percentage by mass).

<table>
<thead>
<tr>
<th>Color</th>
<th>Extra light</th>
<th>Light</th>
<th>Light amber</th>
<th>Amber</th>
<th>Yellow</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extra light</td>
<td>≥ 85%</td>
<td>&lt; 15%</td>
<td>2% included in previous 15 % 0%</td>
<td>5% included in 15 %</td>
<td></td>
</tr>
<tr>
<td>Light</td>
<td>≥ 85%</td>
<td>&lt; 15%</td>
<td>2% included in previous 15 % 10% included in 15 %</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Light amber</td>
<td>≥ 85%</td>
<td>&lt; 15%</td>
<td>5% included in 15 %</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Amber</td>
<td></td>
<td></td>
<td>≥ 90%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yellow</td>
<td></td>
<td>&lt; 20%</td>
<td>2% (included in 20%)</td>
<td>≥ 80 %</td>
<td></td>
</tr>
</tbody>
</table>

Remarks: Color mixtures can be made, but they must be specified on the label.

6 PRIMARY PACKAGES

6.1 The materials and packages used on shelled walnuts must be new, clean, free of contaminants, technically suitable, homogeneous in their presentation and able to provide a proper protection during storage, handling and transportation.

6.2 Packages must be made of proper materials to protect the produce from oxygen oxidative effect and also to avoid giving any inappropriate odors or flavors.

6.3 Since shelled walnuts are products with low moisture content and, consequently, of a highly hygroscopic nature, packages must protect walnuts from moisture in order to avoid alterations.

6.4 Shelled walnuts are packed in plastic (co-extruded) bags or in another package able to contain modified atmosphere, meaning that 98% of oxygen (O₂) is extracted when packaging, to avoid the oxidation process in walnuts.

6.5 Annex 3 shows relevant technical information regarding the correct use of packages and utensils.
7 SECONDARY PACKAGE

7.1 Packaged produce must be placed in corrugated cardboard or in another material that protect it during storage, handling and transportation.

7.2 The container must have directly well attached and firm labels or printed signs with the following information as a minimum:

   a) **Product name:** Shelled walnuts (machine cracked).
   
   b) **Type:** Halves, quarters, pieces, etc.
   
   c) **Color:** According to table annex 1.
   
   d) **Net weight:** Expressed in kilograms.
   
   e) **Company name or exporter name and address.**
   
   f) **Country of origin of the product.**

   Note: In either domestic or imported products, imported walnuts which have undergone processing or modified their physical, chemical, biological, or organoleptic properties must be considered as of domestic origin for marking purposes (Article 107, d).

   g) **Number and date of Health Service resolution that grants plant operation.**
   
   h) **Date of packaging:** Day (by mean of two digits); month (by mean of two digits or 3 first letters of the month); year (by mean of last two digits).
   
   i) **Crop year.**
   
   j) **Code mark or processing plant name.**
   
   k) **Storage recommendations and consumption period.**
   
   l) **Number of packages per container and net weight of each package.**

7.3 Information mentioned in the item above must be written in Spanish; if the product is for export, the language is specified by the destination country.
7.4 Information displayed in each package must allow traceability at any stage of the process; see annex 4 (Identification and traceability).

8 MOISTURE CONTENT

8.1 To determine moisture content, a designed and adjusted instrument must be used, providing that the instrument is certified according the description within the standard.

8.2 Determination will be carried out by comparing and correcting the instrument measurement with the results of dry matter analysis carried out by an accredited laboratory or by the company itself, as described in Annex 5 of this manual.

8.3 This process must be performed at least once a month.

9 NET WEIGHT

9.1 In an individual package, net weight must fulfill tolerances established in Table 4.

9.2 The average net weight of the sample in a packaged lot must be equal or greater than the stated net weight.

9.3 Weighing process will be performed at the end of the packaging line and the weight of 3 units per pallet as a minimum will be registered; being a package (bag, box, etc.) the sampling unit.

<table>
<thead>
<tr>
<th>Declared net weight (nw in g or ml)</th>
<th>Negative deviation allowed in nw %</th>
<th>in g or ml</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 to 50</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>50 to 100</td>
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<td>9</td>
</tr>
<tr>
<td>200 to 300</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>300 to 500</td>
<td></td>
<td></td>
</tr>
<tr>
<td>500 to 1000</td>
<td>1.5</td>
<td>15</td>
</tr>
<tr>
<td>1000 to 10000</td>
<td>1.5</td>
<td>150</td>
</tr>
<tr>
<td>more than 15000</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>
10 SAMPLING PROCEDURE

10.1 Each sampling lot must consist, as long as possible, of produce of a same type, degree, category, size and composition, manufactured under uniform conditions and essentially at the same time.

10.2 Selected produce for sampling must be taken from the lot at random.

10.3 However, when the lot consists of sub-lots or strata, identified by a certain criterion, a stratified sampling must be used so that the size of the sub-sample of each sub-lot is proportional to the size of this sub-lot or stratum. Thus, the sample must be fairly representative of the whole lot.

10.4 Sample is defined as a portion of nuts taken up from a package in a uniform way from a specific pallet.

10.5 A composite and representative sample is obtained by gathering samples from different packages of the same pallet.

10.6 To analyze packaged products:

   a.- At the moment of palletizing, 3 packages from the same pallet must be probability selected; those packages must be subject of an internal quality control in each plant.

   b.- To analyze each sample, 1000 g of walnuts will be probability selected from each sampled package.

10.7 For the analysis during the process:

   a.- Samples must be permanently taken up and analyzed in all production lines.

   b.- Sampling must be made each hour as a minimum.

10.8 There must be a daily detailed registration of all measurements performed by quality control.
ANNEX 2 HEALTH REQUIREMENTS AND HARMLESSNESS

Harmlessness is the condition of any food which guarantees that it will not damage the consumer when eating or preparing in accordance with their intended use. Harmlessness must be set up in all processes, from harvesting until final consumer. It is designed to avoid any health or sanitary risk, or minimize it to acceptable values to achieve harmlessness.

Therefore, each processing plant must have the health issued by the Health SEREMI (by its acronym in Chile).

Hazard Analysis and Critical Control Points (HACCP) shall help both to identify stages and to develop or improve other phases within the manufacturing process:

- Identification of hazards, assessment of their severity and risks, and description of preventive measures.
- Determination of critical control points in order to obtain a quality product:
  - Walnuts drying.
  - Quality control.
  - Sorting tables hygiene..
  - Personnel hygiene, especially of the people who are in direct contact with raw materials; they represent a critical factor to ensure the final quality of the product.
  - Product traceability shall be essential for taking corrective measures and identifying possible contamination focuses.
- Limits must be set by the Quality Technical Standard and proper Health Seremi.
- Monitoring criteria.
- Implementation of corrective actions.
- Data entry.
- Establish procedures to verify that the system is working properly.
ANNEX 3 PACKAGES AND UTENSILS

Materials and objects used during the production process -as well as the ones used in product packing for its commercialization- must be produced in accordance with good manufacturing practices in order that, under common or foreseeable employment condition, they do not transfer their components to food in such quantities which might:

- Represent a risk to human health.
- Cause an unacceptable modification on food composition.
- Cause an alteration on food organoleptic properties.

Utensils, receptacles, packages, containers, wrappings and instruments intended for production, preservation, fractioning and distribution of food must be built or lined with resistant materials and they should not give toxic substances, contaminants, or modifiers to the nutritional or organoleptic properties of such products.

The equipment and utensils used for inedible materials or discarded products must be identified concerning their usage and they will not be used for edible products.

Metals that are in contact with food and its raw materials must not contain more than one percent of impurities constituted by lead, antimony, zinc, copper, chrome, iron and tin as a whole and no more than 0.01 percent of arsenic nor other contaminants constituted by metalloids or metals that might be considered as harmful. Likewise, utensils, receptacles, packages and instruments manufactured with metals should not give the substances pointed out above in higher quantities than the specified previously.

All utensils, receptacles, packages, packagings, wrappings, laminations, films, varnishes, instrument parts, pipes, and plastic accessories that are in contact with food and its raw materials are not allowed to have as residual monomers more than 0.25% of styrene, 1ppm of vinyl chloride and 11pp of acrylonitrile.

All objects made of plastic materials are not allowed to give to food more than 0.05 ppm of vinyl chloride or acrylonitrile, nor other substance used in the manufacture of plastic material that could be health damaging.

Traceability of materials and objects intended to be brought into contact with food must be ensured in all stages in order to facilitate control, recall of defective products, delivery of information to the consumers, and the attribution of responsibility from business operators must be able to identify, as minimum, the companies that provide them such materials and objects.
ANNEX 4.- IDENTIFICATION AND TRACEABILITY

As a minimum, each lot must be identified from the moment of entry into the plant with:

- Date and hour of reception
- Volume delivered
- Moisture
- General condition upon reception
- Variety
- Name of the producer (company name) and orchard

Identification should be represented by an internal company code mark which will guarantee traceability from raw material until finished product and vice versa.

Lot identification must be labeled in all containers, pallets and boxes according to a clearly legible label layout.

There must be a clear identification of the raw material origin at any stage of the process.

Procedure to ensure traceability:

- Methodology and/or manual to keep traceability inside the plant.
- Registers of performed operations in order to ensure process effectiveness.
- To carry out and document a tracking process at least once a month as long as the plant is in operation.
- This can be done during audit or through a simulated recovery action.
ANNEX 5 MOISTURE CONTENT DETERMINATION

Note: Based on the European Community Commission Regulation N ° 175/2001 of 26 February of 2001 which lie down the commercialization standards for in-shell walnuts.

METHOD 1 - LABORATORY METHOD

1. Principle

Determination of moisture content of dried fruits by loss of mass after drying at a temperature of 103 °C (± 2 °C) in a temperature-controlled oven at environment pressure for six hours.

2. Equipment

2.1 Ceramic mortar and pestle or food chopper machine.

2.2 Analytical balance sensitive to 1 mg.

2.3 Cylindrical crystal or non-corrosive metal containers, of 12 cm diameter and 5 cm depth provided with a well-fitting top.

2.4 Electrical temperature-controlled oven provided with good natural convection and with a constantly regulated temperature of 103 °C (± 2 °C).

2.5 Desiccator containing an effective dessicant (e.g. calcium chloride) and provided with a metal plate which allows the containers to cool rapidly.

3. Sample preparation

If required, the sample must be shelled off and kernels must be crushed in the mortar, (or chopped finely) to obtain fragments of 2 to 4 mm across.

4. Test portion and procedure

4.1 Containers and their tops must be dried in the heat cabinet for at least two hours to be transferred afterwards in the drying machine. Containers and tops must to be cooled until they reach the room temperature.

4.2 Four portions of approximately 50 g each should be selected for the test.

4.3 The empty container and its top have to be weighed to the nearest 0.001 g (M₀).

4.4 Weigh to the nearest 0,001 g (M₀), approximately 50g of the prepared sample and spread all over the container basis Then the container should be sealed quickly with its top and weighed as a whole (M₁). These tasks must be performed as fast as possible.

4.5 Place in the oven these recipients open and with their tops beside. Close the oven and let them dry during six hours. After that, open the oven, and rapidly cover the recipients...
with their tops in order to be introduced in the desiccator to be cooled. Once cooling at room temperature, the covered dish should be weighed to the nearest 0.01 g ($M_2$).

4.6 Moisture content of the sample must be calculated as percentage by mass considering the following formula:

$$\text{Moisture content} = \frac{M1 - M2}{M1 - M0} \times 100$$

4.7 The mean obtained from the four determinations must be registered.

**METHOD II – METHOD IN PROCESSING PLANT (FAST)**

1. **Principle**

Calculation of the water content in dried fruit by using a measuring equipment, which is based on the principle of electric conductivity. The device must be calibrated according to laboratory method.

2. **Equipment**

2.1 Ceramic mortar with pestle or food chopper machine.

2.2 Measuring instrument based on the principle of electric conductivity and set up for dried fruits.

3. **Test procedure**

3.1 A glass must be filled with the substance that will be examined (after having been crushed in the mortar). The press must be then tightened until a constant pressure is obtained.

3.2 The values of the scale should be read.

3.3 After each determination, the glass needs to be cleaned thoroughly with a spatula, a stiff bristled brush, a paper napkin, or a pump of compressed air.

NOTE: In order to determine walnuts moisture content with any machine designed for such purpose, there must be a monthly machine calibration by means of laboratory procedures. This can be performed in the company by following all conditions pointed out in this manual or by contracting the services of an external laboratory.