

## Development of a product based on fruit-honey

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### Abstract

Food needs in the local population is varied require many colors, aromas and flavors. We therefore is require innovative products such as fruit jams uncommon as blueberry replacing sugar with honey. It formulates a based fruit -honey product to obtain a sensorial acceptable jam between various formulations. Sensory distinguished color is not different, but in aroma, flavor and general appearance is established that the best accepted is the formulation with 50 % fruit and 50 % honey. The best accepted sensory jam (400 g honey, 400 g fruit) was performed according to determinations physicochemical test and costs. The physicochemical analysis shows that the jam has obtained the necessary criteria to meet Mexican Standards of Quality. The cost for processing is available for the production of a small company and great feasibility to be marketed.

### Honey, Jam, Blueberry

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## Introduction

Healthy, balanced and preventive food based on a rigorous scientific basis is not an unnecessary luxury when it comes to health costs. And the quality of food is due to its organic and inorganic components that man desires to keep as long as possible. Food preservation is as old as the name itself and is so used today to provide great benefits (Chacón, 2006).

Food is always freshest of optimum quality at the time of its harvest or slaughter. To maintain this quality in the foods that are to be consumed later, they can be preserved with cold, heat, chemical preservatives or a combination of these methods. Cold usually means refrigeration or freezing. Heat includes many processing methods, such as pasteurization, commercial sterilization and drying. Other ways of preserving foods include adding ingredients for their conservation to process them through fermentation media. Raw foods are processed to make them easier to store besides consuming, it becomes something that may be more desirable. Strawberries can be processed, processed into frozen or dried fruits for use in cereals, or can be cooked to make jam.

Different types of food are preserved as well as processed in different ways to extend the time period in which they can be transported, displayed in a business, purchased by the consumer. The physical and chemical composition of food helps determine the type of process required for its conservation. Other factors that influence when choosing the method of conservation are: what final product is desired, type of packaging, cost and methods of distribution. The two most important factors in chemical composition that affect the way a food is preserved are water content and acidity.

The water content includes the level of moisture, but something even more important is the activity of the water. Water activity ( $A_w$ ) refers to the energy state of the water in the food, whether chemical reactions will occur and / or microorganisms will grow. The content of the food - such as sugar, salt, protein or starch - "binds" to water, making it less available. Foods with lower water activity are less likely to decompose because of microorganisms and have fewer undesirable chemical changes during storage (Clayton et al., 2016).

One way to use a fruit to make it available all year round are the conservation methods by concentration of sugars, such as jams, ates, jellies, etc. A mixture of fruit and sugar that comes in semi-solid form gives rise to jams. The mixture is made under heat conditions and with the addition of pectin, depending on the type of fruit being used, acid is added to adjust the pH at which the gel is formed. The fruit can go whole, in pieces, strips or fine particles and must be dispersed evenly throughout the product. Fruit is the main ingredient of jams and gives them their own personality. The fruit defines the product formed, according to the characteristics of the fruit and determines the quality of the final product (Coronado, 2001).

The blueberry, whose scientific name is *Vaccinium* sp, is sweet-sour, juicy and aromatic. Blueberry has been obtained from wild plants, but in recent years is when it has begun to grow. Is the largest producer, consumer, exporter and importer of blueberries in the world and together with Canada, they account for 90% of the total production area, followed by Chile (which pioneered blueberry cultivation in the southern hemisphere), Argentina, New Zealand, Australia and South Africa.

The main European producing countries are: France, Holland, Germany, Poland and Spain. The countries that demand this type of fruit are: Japan, Italy, England, Belgium and Holland. Canada is the world's largest supplier of frozen blueberries, but unlike the US, Canadian production is mostly wild-type.

Chile and Argentina offer fresh markets to the main markets located in the northern hemisphere (US, Canada and some European countries) when they are in their winter season and cannot be supplied with their local production.

Mexico, has advantages for the production of blueberries compared to its competitors. The cost of labor is relatively low compared to other producing countries in the southern hemisphere. In addition and as a great advantage is to be one of the few countries free of the fruit fly, unlike other competitors who must fumigate 100% of their shipments to the United States, with the consequent additional cost and damage in the quality of Fruit. At the national level approximately 2,000 ha of cranberry are grown. The states most representative for their production are Michoacan (600 Ha.) In addition to Jalisco (400 Ha). Virtually all of the national blueberry production goes to the export market. The main producing states in the country are: Michoacán, Jalisco, Nayarit, Hidalgo, Baja California, Veracruz, Puebla, Chihuahua. Among the many varieties used at national level are Sharpe Blue, Milenium and Biloxi.

Blueberry as a plant is a small shrub 0.2-0.4 meters high, whose scientific name is *Vaccinium* sp., belonging to the family Ericaceae. The flowering period should be free of the frost period. It requires slightly acidic soils with its pH between 4-5, which is maintained acidifying the water of irrigation.

Its leaves are alternate and toothed with short petioles. The Flowers: are pendulums and open solitary in the axilla of the leaves. The chalice, which is scarcely marked, has 4 or 5 obtuse teeth. The pale green spherical corolla leaves the stigma to stand out. Under the earth develops a network of superficial roots and creeping shoots, giving rise to straight, quadrangular, much branched strains, the oldest part of which is covered by a thin gray bark. It is an important plant from the ecological point of view, not only because of its fruits, but also because it protects the soil from the forests from erosion and contributes to the formation of humus (Bernal, 2010; Infoagro, 2016)

Up to two decades ago most of the honey production was destined to the international market (76.8%) (FAOSTAT, 2015); However, this trend has changed, and at present little more than half of the production is traded in the domestic market, hence the evolution of the national economy, and especially that of families, increasingly influences the Production and beekeeping marketing. For example, domestic demand for honey has undergone significant changes in recent years, its indicator, per capita consumption, went from 170 g in the 1990s to 316 g in the present, representing an increase of 85.9 %; But still below the consumption of countries such as Greece, Germany, Switzerland and the United States, where the kilogram per capita is exceeded. With regard to internal marketing of honey, the beekeeper sells little to the final consumer, and the price he receives usually depends on the number and market power of the agents involved in the process. The most extensive commercial channel is the one that includes the industry, which uses honey as an ingredient for the elaboration of foods such as cereals, yogurts, sweets and breads.

Or as a raw material for the tobacco and cosmetology industry, which increasingly occupies more products such as pollen, propolis and royal jelly (Sagarpa, 2010).

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The largest contribution was recorded in 1996, when it accounted for 27.8% of the external revenues of this subsector; these revenues increase the domestic supply of financial assets and favor the balance of payments current account balance, among other macroeconomic benefits. This contribution of foreign exchange in Mexico is higher than that registered in Argentina in 2008 (0.22%), Brazil (0.02%) and China (0.01%) (BW, 2012). On the other hand, the social importance of beekeeping in Mexico is observed, in the opportunity of production and income, and in the generation of jobs. In relation to the first, and considering that in 2008 there were 1.79 million hives in approximately 34 thousand production units or apiaries with an estimated yield of 29.1 kg per hive and sale price of \$ 25 / kg, allowed an income of 1,307.7 million Of pesos, a value that represents the impulse to the local economies and, in turn, the improvement in the to 27.8% in the welfare of the families.

The second social aspect of interest is evidenced by the 2.2 million working days that beekeeping generates per year (64.7 days per apiaries) and the payment for wages of 263 million pesos. Thus, the income from sales of honey, wages and the value of the purchase of inputs, equipment and materials, are the main items of the multiplier effect of income generated by this activity on the locality or region of the country.

The economic and social importance of beekeeping is limited to its contribution of foreign exchange and the generation of jobs and income in rural areas; its contribution to GDP has declined significantly in the last two decades.

The production is destined mainly towards the collection centers, from where it is transferred to the wholesalers for its export, who determine the price in bulk; the conditions imposed on the markets have a negative effect on the dynamics of the activity. The distribution of value added to honey is inequitable and its difference

Is based on the capacity of appropriation or market power of the members of the chain. As a result, the price received by the beekeeper is comparatively low and the share of its equivalent value represents little more than a fifth of the price paid by the final consumer (Magaña et al, 2012)

Honey is a sweet and natural product, which unlike other sweeteners, has no refining processes like white cane sugars and sugar beets and does not need preservatives, often used in industrial manufacturing. Honey does not contribute fat or fiber, in relation to inorganic nutrients and vitamins their contribution is scarce.

Moderate consumption of honey does not cause overabundance of sugar in the bloodstream because the necessary process of conversion of the levulose is much slower and gives enough time to the body to proceed to the elimination of sugars. That is why honey can be consumed by stabilized diabetic patients (medical diet: consuming small amounts of sugar) as it produces less damage than common sugar (Ulloa, 2010).

Among one of the numerous qualities of honey we can say that it is a powerful energizer; 330 kcal / 100 g. Suitable for athletes as it allows them to recover quickly from great efforts as well as less evidence of fatigue. It is also recommended for fatigued and elderly people (Mendizábal, 2005). The food needs of the population are varied, many of them demand new colors, aromas and flavors. For this reason innovative products such as fruit jams are not required, such as cranberry, replacing sugar with honey with a very wide commercial potential.

The product with greater sensory preference will be determined physicochemical, sensory and cost analysis.

### Experimental Development

It is part of a base formulation of a suitable jam with honey instead of sugar (Table 1) for its suitability of the ingredients:

Ingredients	Quantities
Cranberry	400 g
Honey	400 g
Citric acid	2.0 g
Pectin	5.0 g
Sodium benzoate	1.0 g

**Table 1** Base formulation of the product (Jam)

Several tests of jam formulations are carried out to determine the amount of fruit-honey, honey-sugar, honey-sugar-water to finally achieve a proposal of three formulations which are evaluated by a panel of untrained judges through a test Sensory preference.

Previously, the water-honey proportionality was established to know the exact proportion of Brix Degrees to be obtained in the product as a more adequate calculation of quantities to be used. Various formulations and varying amounts of fruit and honey are prepared, until the method of obtaining a marmalade with commercial characteristics is standardized.

A multiflora honey predominated with Flor de Azar (mielopolis), fruit from an orchard in the city of Atlixco, Puebla provided directly by the producer. The main raw material honey has a clear color, liquid consistency, characteristic odor, pleasant taste to the palate, with a moisture content of 18%, total carbohydrates 66% and 2% of minerals as well as vitamins according to the brand label.

Procedure for making the jam: Place the fruit in a suitable container and wash it thoroughly with soap and water, without damaging it. Weigh out pectin, citric acid, sodium benzoate and honey.

A) The fruit is selected, eliminating the chopped or infested fruit, chopping the fresh fruit into small pieces.

B) Cook the fruit to soften the pulp by moving slightly, 5 minutes later the honey is added by constantly stirring using a moderate fire, previously established the water-honey ratio for Brix grades required by the product.

C) Pectin and citric acid are added to the appropriate Brix grades (60 to 65) or to the cup and the preservative is added.

D) Once the hot processing is finished, it is poured into the final package and a vacuum is generated when it is closed.

E) It is allowed to cool, labeled and stored.

Finally the finished product is carried out the physicochemical analyzes:

Humidity by the Thermobalance method, Proteins by Microkjendhal, using the universal factor (N X 6.25), Soxhlet Ethereal Extract, Calcination Ash, Nitrogen Free Extract by difference (NMX-F-132-1968). Chabacano Jam, Brix Grades for Refractometry (NMX-F-131-1982), Titration Acidity, Ph (NMX-F-317-1978), Sodium and Potassium (NOM-086-SSA1-1994). Each test was performed in triplicate, the mean and standard deviation were determined by means of a computer program (SPSS, 2014).

Sensory evaluation By the Duncan method, with a structured bimodal scale, hedonic of 9 points where 1 = I dislike at all to 9 = I like extremely and with value of 5 = neither likes nor dislikes untrained panelists, without distinguishing between sex and an age range of 18-23 years of age. In addition an estimation of product costs is made to establish the competition in the market.

## Results and Discussion

Starting from the base formulation of marmalade (Table 1) the different concentrations of fruit and honey, honey-water and some other variables were started (Table 2) until acquiring adequate consistency, as well as sensorial characteristics similar to a commercial product

% Honey	% Fruit	Modifications
40	50	10% sugar
50	50	With water 200 ml and
100	50	fresh fruit
50	50	Without water

0	50	Dried fruit
80	20	Honey syrup%
45	55	Water 300 ml.
50	50	Water 350 ml
50	50	Acid free

**Table 2** Formulations obtained from fruit-honey jelly

Applying the method of multivariate factors based on the fruit-honey and as a third factor the ingredients applied in the elaboration, for some formulations very rigid gels with an approximate consistency to the caramel, other very light ones with little acidity and little formation of the gel So jamming was not achieved (Table 2).

The above are only defects of the jams in their elaboration by the fruit and how the amount of honey influences in addition to the prolonged heating or very dilated of the cooking to acquire the consistency of suitable gel. In the first case it is generated by prolonged cooking because it causes a high inversion causing rigidity, since the honey is more sensible to the heat than the common sugar. In the second case, an imbalance of the acidity and its interaction of the pectin with the different carbohydrates of the honey is generated, although also the pectin amount could have been degraded also by a prolonged cooking without forming the gel, also produce a caramel or a flaccid gel.

Of these 9 formulations, they are eliminated by their physical and sensorial aspect seven, leaving us only with option 2 and 4 which for their sensorial evaluation it was decided to take as a base the combination of both and to vary the concentrations of honey.

Once the jam formulation is adjusted, 400 g of honey and 400 g of blueberry, 250 ml water, citric acid 2 g, pectin 8 g and sodium benzoate 1 g are optimized.

Once the formulations to be tested have been established, the sensorial analysis is carried out to validate the best accepted among them. Here the quantity of fruit is constant and it was modified in the amount of honey in 400, 300 and 200 g, being FA, FB and FC respectively.

It is noteworthy that sensorially does not compare sensorially with a commercial marmalade since the honey in combination with the fruit the product possesses by itself sensorial characteristics very different any marmalade commercial irrespective of the fruit that is used.



**Graphic 1** Sensory evaluation of marmalade formulations

Red framed value of the same radial axis, there is significant difference ( $P < 0.5$ ).

In the sensory test there is a significant difference in the aroma, flavor and general appearance for the FA formulation which contains more fruit and 40% in honey, possibly due to the fruit's own taste that does not mask honey.

And among the other two formulations the untrained panelists do not distinguish some difference in aroma, general appearance and taste; the color is not different for the three formulations. Taking all the sensory characteristics, the one with the highest preference in color, odor, taste and general appearance is the FB formulation with 400 g of fruit and 300 g of honey, which is determined physicochemical analyzes in addition to costs. A marmalade made Pumpkin fruit (*Telfairia occidentalis*) is elaborated by comparing it sensorially with orange marmalade (Egbekum et al, 1998).

Using a bimodal structured scale of 5 points not accepting it sensorially in both color and flavor given by the consistency-color of the obtained marmalade. Also, when mango jams of different varieties and green pistachios (Kansi et al., 2003; T. Mohammadi Moghaddam et al, 2009) establish that it is important to control the quantity of fruit or seed, pectin and the heating to possess a viscosity Proper jam. In both cases they denote the obtaining of a good product with viscosity to make that sensorially a jelly is accepted using fruit or seeds.

Determination	Jam	Reference- * NMX
Protein %	00.11	0.0-0.1
Ash%	00.35	0.30 Min
Abstract	00.12	0.0-0.1
Ethereal%	96.00	36-72.
E.L.N%	03.00	18-20
Humidity %	64.00	65.00 Maximum
Degrees	00.23	0.30 Maximum
Brix%	03.30	3.0-3.8 Maximum
Acidity mg	06.67	7.07
Ph	00.06	Golden Hill Brand
K mg		1.0

**Table 3** Physicochemical analysis of the best accepted jam (FB)

E.L.N: Nitrogen-free extract (---) = no data available

The obtained marmalade (honey) was compared against a trademark of the same fruit (sugar), low lipid, protein and ash content, similar results are obtained by Kansí (1998) including Ph, an acid Ph is differentiated from the commercial product. A low percentage of moisture stands out for the obtained marmalade, pistachio jams, mango even Smelly-berry (*Vitex mombassae*), Loquat (*Uapaca kirkiana*), Marula plum (*Sclerocarya birrea*) marmalades possess values of 18-33% (Ndabikunze, 2011) this may be due to the fact that honey, water and pectin with not very high temperature can form gels with viscosity in addition to stable consistency, forming nets with fruit in addition to large amount of total carbohydrates as described Kansí, Egbekum, Mohammadi characteristic Of jam made with fruit.

The acidity of the product is similar to the Standard although Shahnawaz (2011) describe higher acidity, of course this depends on the fruit although the honey does not influence the final acidity of the product if it contributes to the consistency of the gel, as well as stability of this. Both Sodium and Potassium have nutritionally low values and would not be an adequate contribution to consumer nutrition, on the other hand comparing against the trademark marmalade are similar, these are lost during cooking to obtain the gel. Brix grades are important in marmalades so it was possible to reach 64 ° without sugar, it is important to achieve the balance between acid, pectin and sugar to give it the consistency of gel.

Ingredient	Quantity	Unit cost
Fruit (g)	200	\$40.00
Honey (ml)	300	\$10.00
Pectin (g)	5	\$3.00
Sodium benzoate (g)	1	\$2.00
Total		\$55.00

**Table 4** Estimation of the cost of fruit-honey marmalade

The cost of the marmalade (500g.) Is 55 pesos, this cost is not high since some commercial jams of the fruit get to be worth the 300 g. The 50 pesos. When formulating the jam was not cranberry season so the value of how much this fruit is commercially high, if it is taken into account to produce it in the harvest season and that the beekeeper to the honey has at hand the costs would be reduced considerably. The most accepted formulation was the one with less honey, which means that the cost does not rise.

### Conclusions

It starts from a base formulation substituting honey for sugar to give it the viscosity and consistency of a commercial marmalade.

The honey-water ratio was established to obtain a product with the required Brix Degrees.

Formulations were developed with variations of cranberry-honey marmalade and through sensorial analysis it was selected from the best sensory acceptance by the untrained panelists.

The physicochemical analysis shows the jam has the necessary criteria to comply with the Mexican Quality Standards, with low lipid, protein and ash content. Brix grades characteristic of a marmalade, acidity and low humidity that establishes advantages in shelf life.

The cost to produce it is accessible for the production of a small company and that a beekeeper or a producer with Cranberry orchard would have the advantage of a raw material without cost.



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 nombre de la norma: mermelada de durazno  
 tipo de producto: conservas clave de  
 documento: NMX-f-130-1982

Norma: mexicana tipo de norma: voluntaria  
 nombre de la norma: mermelada de fresa tipo  
 de producto: conservas clave de documento:  
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Norma: mexicana tipo de norma: voluntaria  
 nombre de la norma: mermelada de naranja tipo  
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Norma: mexicana tipo de norma: voluntaria  
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