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Specialty: science of vine

Theme:

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OUIZA

Part 2: experimental part

Chapter 3: Materials and methods

Chapter 4: discution and result

Liste of abbreviation:

P.N.B: product national brute

%:percent

Abs:absence

ARMV: Arabic mosaic virus

C°:degree Celsius

Cm:centimeter

DAP: diammonium phosphate

G:grams

GAE: galic acid equivalent

GFLV: grapevine leaf virus

GLRaV:grapevine leaf roll associated virus

H:hour

Ha:hectare

IFV:institute of fruit and vine

J_1:juice pure

J_2:juice basis on a concentrated

K:potassium

Kg:kilogram

L: liter

Lux: lumen

M: average

M: meter

Mg:milligram

Mm:millimeter

MT:metric tonnes

N:effective

NaoH: hydroxide sodium

OIV:office international of the vine

P:product

PPm: weight per million

PPO: polyphenoloxidase

S:sum

V: volume

Liste of figure:

Liste of table:

Introduction

Introduction

Introduction:

Grapevine has been all over the world a plant for the wine, raisin juice and table berries production; it is the most economically important fruit crop in the world. *Vitis vinifera* (common grape vine) is a species of Vitis, native to the Mediterranean region, central Europe, and southwestern Asia, from Morocco, north Portugal to southern Germany and east to northern Iran. There are currently between 5000 and 10,000 varieties of Vitis vinifera grapes though only a few are of commercial significance for wine and table grape production.

Although there are long time in Algeria, the vine knew no a real growth after 1850. In fact, this extension of the vineyard Algerian was especially the production of wines cutting intended mainly export.

However, the current demand of consumer countries tends to reduce, and quality wines are required on the market.

Given this situation, several solutions were envisaging:

-Conversion of the vineyard,

-Decrease in wine production,

-extension of vineyard table… etc. **(ZOHARY and HOPE, 2000; THIS et *al*, 2007).**

Before independence, and until the 1960s, viticulture in Algeria occupied an area of the order of 350.000 ha with a production reaching 1418 million hectoliter of wine per year, for vine of table , and the vine for the raisin is not existed too,**(ISNARD, H., 1947).**

Just afterindependence, Algeria was the fourth wine producer and the first exporter, of wine which represents at that time 50% of exports and 30% (P. N. B Agricola).In order to overcome the wine surpluses, the establishment (according to CHALLANDA, St- Georges fact)gave birth to fruit juices, especially grape juice**.**

The future prospects of grape juice will be influenced largely by the evolution of the population that requestsincreased production; this will be also quite possible if all constraints are resolved, and by a reasonable a grape juiceprice.

In recent years, demand for quality products has become so important that the various actors of the sector of fruits give to quality a privileged status. But it is not so obvious to define the "quality": it may depend on such constraints like immediate production and marketing

(template, resistance to manipulation, attractiveness of the product...) and market developments.

Thus, the longer distribution channels and the increase in mass consumption showed technical difficulties and logistics to maintain a quality of consumption during the steps of storage and distribution.

Our work was oriented on these data concerning grape juice totry to respond to some questions, which can occur to a juice manufacturer at Akbou before launching this new product:

-The manufacture of pure grape juice of a white variety and a grape juice based on a concentrated grape white juice.

-A comparative study between two grape juiceswas accomplished about their nutritional, physicochemical parameters and even their scores of sensory testby a panel of testers.

Generalities on the vine

Generalities on the vine

1-The vine, through the time:

The origins of the vine have been studied through the discovery of vines fossils **(HUGLIN and SCHNEIDER, 1998).** Before the appearance of man on earth at the end of tertiary or 3 millions of years B.C., several indices (presence of seeds and pollen) had proventhat vine was present in Western Europe and Minor Asia**.**During quaternaryera, some species survived to glaciation in shelters spared by the cold; where was found *Vitis silvestris*, gathering with the wild forms or Lambrusque of *Vitis vinifera* in the spontaneousflora of Transcaucasia, Greece, Italy, France, Germany and Spain **(REYNIER, 2007).**

It is not known exactly when men began to interest in the picking of grapes. In the antiquity these fruits came from strains who had grown spontaneously inside the vegetation and from probably natural planting made randomly of these dioceious wild forms, which arecalled the Lambrusques and persist until today in several remote areas of Austria, Italy, Germany, Greece, and even in Kabylia(Algeria) where Lambrusques are certified since antiquity.

According to **(REYNIER, 2007), c**ulture of the vine started about 5 to 6 millenniumsbefore J.C. from shelters of Transcaucasia and Iran where men have discovered the use of this plant as food. Then it was multiplied by cutting and domesticated by the size, away from the grape varieties, that is to say selections in populations Lambrusques; then migration of men to the south (Palestine, Egypt) then to the West (Greece and Roman Empire) have lead to the development of the culture of vine and ensured the transport of these first grape varieties to other regions.

Always in this direction and hypothesis, according to **(SPAHNI and LABYS, 1992),** the culture of the vine spread gradually over the centuries, from the Middle East to temperate zones of North Africa and Europe, then to Americas, South Africa, Austria and extreme east. According to **(LEVADOUX, 1956)**, thereis closer links between the wild and cultivatedvines, considering that actually only one species *Vitis vinifera*, exists in Europe, Asia and North Africa.**REYNIER, (2007),** reports that V. *vinifera* has great qualities for the production of wine grape, table grapes and raisins. This species is cultivated in temperate zones; it is well multiplied bythe vegetative method.

2-Descriptionof the plant:

From the systematic viewpoint, the vine is a plant with seeds (Spermaphyte). It is classified inside the family of Vitacées. Eighteen types were foundinside this family **(HUGLIN, 1986; ATTIA, 2007):**Many of which arewellknown as ornamental plants. The genus Vitis is found primarily in temperate regions of Asia, North America and Central America. Twenty species grow spontaneously in North America and Mexico**(SPAHNI and LABYS, 1992).** Among recent was included the vine Shoreline (Vitis riparia) which is the only wild vine native of Quebec. The vine foxes (Vitis lambrusca) extends from northeast of the United States until southern Ontario. This species are responsible for several varieties grown in these regions.

In Europe, there is a single spontaneous vine (*Vitis vinifera*) which can be divided into two subspecies: the European wild vine (*Vitis vinifera sylvestris*), and the European cultivatedvine (*Vitis vinifera sativa*)**(GALET, 2000).**

The European vine being cultivated since millennia gave birth to thousands of cultivars. In addition, there are "pure", species, whichmust be added to a growing number of hybrid vines (Vitis X) issues crossing intentional or not between different species.

The vine is a creeper perennial and woodyplant. There are vines more than centenary. Although we imagine most part of the time that a vine is a plant stem hail requiring support, we must know over time and if it has enough space. The trunk of the vine may have a development much more considerable. Some vines have a trunk of 2 meters from circumference and cover more than 500 meters square. It is mainly the size, whichmaintains the vines cultivated in smaller dimensions.

The vine cultivated; v. vinifera L. includes thousands of varieties or grape varieties, within which it hardly been possible to make classifications further**.** A variety, according to (**REYNIER, 2007),** is usually a population of clones (variety polyclonal); the clone designating all copies of the descendancy by vegetative a strain mother. The same author states that if once we multiplied and cultivated clones all without distinguish them, currently the wine grower plant separately one or more clones of grape variety he chose to meet the production targets.

Despite every effort of the description of the plants, we have failed to draw up so far full inventory of grape varieties grown worldwide, but can estimate the number to several thousand, **(REYNIER, 2007),** adds that the grape varieties have not all the same vocation.

According to the morphological characteristicsof clusters and berries, and depending on the destination of grape, it distinguishes several categories of grape varieties**(Table n°1).**

Grape variety of tank	Grape variety Table	Grape variety drying
- Berries juicy suitable to pressing. Example: Chardonnay, Carignan.	- Clusters loose berry quite large, to pulp crisp and skin resistant. Ex. date palm of Beirut, Cardinal.	- Berries generally apyrénes(seedless) and pulp quite consistent Ex. the sultana But sometimes has Bay Pyrenees Ex.: Muscat of Alexandria.

Table n°1: grape varieties (**REYNIER, 2007**).

According to **SIMON and*al*, 1992,** the vine cultivated belongs to the following classification:

Branching: Angiosperms

Class: Broadleaf Weeds

Subclass: Archichlamydées

Order : Rhamnales

Family : Vitacées

Kind : Vitis

Species:*Vitis vinifera* L.

2-1-The roots:

The roots of vines produced by cuttings are formed mainly at the nodes and head in all directions (horizontal and vertical). Their length depends on the age of the plant, the nature of the soil and work of this latter. When rootsare not restricted in their development, they can reach more than ten meters therefore gives to the vine a tolerance to drought. The nature of the soil also has an impact on the quality of wines particularly vines grown on rocky land. Like the rod, the roots are used as warehouse of reserve substances, mainly starch, which will be mobilized at bud break of spring. A good root development is important not only for anchoring of the plant, but also to the water absorption and mineral elements but for a good production of fruits **(HUGLIN and SCHNEIDER, 1998).**

2-2-Trunk, arms:

The trunk is the support of the aerial vegetative system of the vine (branchs); in several branchs or bearing rods of the year called branchs as long remain herbaceous and became branchs afterwards **((REYNIER, 1989).** The gradual change of thebranchs in August is recognizable externally by the passing of the greento the brown colour **(REYNIER, 2007).**

According to **HUGLIN and SCHNEIDER, 1998;ROLLER, 2000,** from outside thematuration, noticeable by the gradual change of the color, from different green shades tobrown what is called bark that it dries and becomes rough, before the end of the winter, bark can come off the form of fibrous strips or as thin skins onions.

2-3-The branch from latent buds:

By the cutting of the stems in winter, the winemaker causeslatent buds to fructify. In the case of varieties, “portes greffes’’ the latter specification has received no interest. Growth of these branchs will continue at least until mid summer and then occurs then a phenomenon of maturation, characterized by the development of parenchyma Liber and wood, accumulation of starch in the ray cells and considerable decrease of water content. From this time, they became true branchs. A rod with nodes forms the branch of the vine, while the interval between two consecutivenodes is called merithalle**(HUGLIN, 1998).**

2-4-Leaves:

The leaf have five main veins, which start from thepetiole. The relative dimensions each in relation to other, angles, which separate them, are at the origin of a number of elementaryforms: limbo as cuneiform, pentagonal, circular and kidney- shaped. However, the enormous variability other characters such as nobes, teeth, and the sinus petiolar... makes that

leaves are body's choice for differentiation of varieties.Leaves of vine are inserted on the nodes in alternate position with a divergence of 180°. On the axes, directly from the germination of a minor problem, leaves are, first not diametrically opposite but have a divergence of 144° or 154°(**HUGLIN and SCHNEIDER, 1998**).

2-5-Buds:

According to **(GIRODET, 1990),**the first type of buds consists of terminal buds, which trains and growth of the various organs of the branch. At the end of the vegetative period, the apical meristem of this bud ceases to function and after a long time, it is dried and falls.Two types of budsare distinguished: prompt- bud and eye latent. Inserting each type of bud will be alternately left and direct petiole.Different authors, the majority of which agrees to the Perilousthesis (1856), studied the meaning of morphological of the prompt-buds and latent buds.

2-6-Tendrils and inflorescence:

According to **GALET, (2000),**these two bodies are identical and found all intermediaries between the twoperfect types. Generally, tendrils of the vine are bifurcated. It include a peduncle, a branch major located in the armpit of a bract and a branch minor.Their dimensions are specific to varieties, animated of a rotational movement, they wrap around the media which they have hung with bulge adhesive their ends. Tendrils are lignifying as well as branches.

Inflorescences appearing in the latent buds show themselves very quickly after the bud break or burgeoning. Growth of the ramifications, at the beginning is particularly fast as regards to the main axis and the peduncle, continues until ripening. Inflorescences have secondary axes tertiaryand quaternary. Spin or inflorescences appear opposite folies (opposite the leaves) throughout the Vitis genus.

2-7-The flowers:

According to **GALET, (2000),** flowers are grouped as inflorescences; depending on varieties and the environment, the number of flowers by inflorescence is variable. The vast majority of varieties' fruit have hermaphrodite flowers. A few varieties are however females and require thereforepollinating varieties in their plantations.

The American species and some Asian species arediocious; these varieties are either male or females. Nevertheless, there are rarely, varieties with flowers intermediate between hermaphrodite, male or female.

2-8-Clusters and berries:

After the fruit set flowers, the inflorescences are commonling called clusters. According to the varieties and conditions permanent or annual medium, the number of berries will be much smaller than flowers because of the intervention of the phenomenon of sagging(falling).

Dimensions, forms and other features clusters and berries are extremely variables and can be criteria recognition of varieties: size of the cluster itself, compactness, length of the peduncle, shape and color berries, coloring pulp, and special flavor berries**(HUGLIN and SCHNEIDER, 1998).**

Clusters are composed of a set of ramifications, which are identified, as inflorescences, the stalks or tail grape, the main axis or spine and pedicels bearing berries or grains.

The grape includes the skin or film consists of the cuticle, the epidermis and hypodermis, where are located aromatic substances, pulp, only colored in grape varieties, the vascular bundles, which provide nutritional berries, and seeds.

Seeds are hard, evolve to the ripening stage and will reach later their physiological maturity or ability togermination, which depends on the early variety**(BALTHAZARD, 1979; GALET, 2000).**

3-The pedoclimatic requirements of the vine:

3-1-Agro- climaticrequirements of the vine:

It should be recalled that the various biological processes do not depend on a single factor but on several factors.It isimportant, therefore, to have in mind,factors either intrinsic (genetics) and extrinsic such as ecological factors and agricultural practices.

3-1-1-climate requirement:

Climate is the most important factor since it may cause some extreme conditions responsible for damage or physiological diseases: frosts of spring and autumn can touch areas more or less extended.

- Rain or humidity high and/ or low temperature at the time of flowering can lead to sag clusters.

- Intenseexposure to sun causes sunburn of clusters.

Further damage above, climate influence strongly the presence and development of most pests.

The classification of climate has long concerned geographers and botanists, but the problem is actually very complicated, so that many authors continue to proposed some ideas and hypotheses.According to **(BRICHE, 2011),** to develop the vine, we need a climate including requirements as solar radiation,temperature and water.

3-1-2-The light:

According to **CHAMPAGNOL, (1984),** the light is a primary factor for photosynthesis. In addition to the use of measurement unit's energy indicated above, the light radiation is most often measuring in photometricunit. The source unit is the candle: it is the sixtieth part of radiation emitted by 1square cm<< body black>> brought to the melting temperature platinum.

The unit flow is the lumen, the total flow issued by a candle being 4 lumens. The unit illumination is the flow: it is the radiation of 1lumen received by an area of 1m2. For example **(CHAMPAGNOL, 1984)** reported that the maximum that can be received in Montpellier by a horizontal surface, among the beautiful summer days, corresponds to 96000 Lux. Other authors consider moreover also that the brightness sky does rarely reach 100000 Lux. to assess the photosynthetic efficacy of the light radiation cannot considers often as the visible spectrum, designated by the acronym (Photo-synthetically active radiation). Light intensity using a photocell and expressedin percentageby corresponds to about 50% of solar energy received.

3-1-3-The temperature:

The thermal factor influences mainly on the development of the plants in relation to their geographical localization. The distribution of vitacees in the world is partly due to this factor, for example *Vitisamurensis* in areas such as climate of continental Asia, because of its resistance to cold. The thermal specific needs of vine varieties fruits are also the most important in relation to their distribution in the different wine- growing zones of the world**(BRICHE, 2011).**

3-1-4-Source of water:

Among ecological factors, water has anessentialplace: gravimetrically it is the most important constituentof living organisms including plants. It provides multiple functions participating to metabolism in biochemical reactions and transporting materials and synthesized products, and evaporation. It protects organisms against heat. Waterof the soil plays a role on the procedures for the power mineral plants, rather than about the concepts general on this issue. Two aspects direct concern the vine: The estimate of water resources according to the needs of the plants, the influence of regime, supply water performance, quality wine and juice**(CALU, 2004).**

3-2-The requirements edaphic:

According to **(ATTIA, 2007),** the vine is a culture which is expected performance through a valuation of poor settings from a view agricultural According to **(HUGLIN and SCHNEIDER, 1998),** the vine fits a wide range of ground, since the soil dry, poor to the soil clay limestone.

Rooting is the main seat transfer between the middle edaphic and the vine and that faces" atmosphere" physicochemical very diverse that can act strongly on growth of the vine.

3-3-The requirements cultivation:

3-3-1-Maintains the ground:

- **Evolution:**

According to **(Champagnolf, 1984),** the digging and hoeing formed the only ways agricultural, implements allow maintenance soil, in order essential, apparently it, to eliminate weeds referred to as bad herbs.

- **The ways agricultural implements**
- **The desherbages chemical**
- **Paillage plastic**

3-3-2-The enrobements controlled

- **Irrigation:**

The irrigation aims to maintain the ground of the vine always wet and well distributed in time and constant **(WALALI LOUDYI et al, 2003),** the effects is manifested by a vegetation more abundant and grains largest**(RAYNIER, 1991).**

- **Size:**

The size must be carried out each year during the dormant: December, January, February; it ensures a construction ordered of the plant and promote a good sharing sugars, by establishing a good balance between the fruiting and vegetation**(WALALI LOUDYI et al, 2003).**

4-Cycle biological of the vine:

4-1-Cycle vegetative of the vine:

The vegetative cycle begins with tears before the bud break departing buds in vegetation giving birth to the growth of branches and leaves ending in the fall by the defeuillaison or fall leaves, which marks the end of working life. The vine between then alive slowed because it is no longer any external manifestation visible: it is the rest winter sleep, still called more generally dormancy**(WALALI LOUDYI et al, 2003).**

4-1-1-The Tears:

They are the first event external passage of life slowed to working life and correspond to the entry into activity roots, under the action recovery of soil temperature occurs activation of the cellular respiration, a cover of the water absorption and mineral elements as well as a mobilization of reserves**(REYNIER, 2007).**

4-1-2-Size:

The end of the winter is the best period for cutting of the vine to avoid too strong frosts.

4-1-3-Bud break:

According to **(REYNIER, 2007),** when the buds begin to inflate in the spring, an appearance of the first buds, then burst birth of the first leaves.

4-2- Cycle reproductive:

4-2-1-Flowering:

We speak of flowering is to say the development of the flower**(WALALI LOUDYI et al, 2003)** and during this period the vine is fragile for vagaries of the weather (frozen night, hail).

4-2-2-Pollination:

Is the release and transport pollen. The vast majority of varieties fruit has flowers hermaphrodite a few varieties are however females and require therefore varieties pollinating in their plantations **(WALALI LOUDYI et al, 2003),** the entire phenomenon for a cluster called the fruit set.

4-2-3-Fruit set:

The grapes green as beans, are very small and consistency very hard,theyare very acids.

4-2-4-Ripening:

According to **(REYNIER, 2007),** beans grow they change color, they become translucent (for white) or black appearance sugar.

4-2-5-Maturation:

The grapes take their final size. They accumulate sugar and lose acidity

5-The main diseases and treatment:

Different fungi causing diseases that are harmful to harvest can contest the vine. The main are mildew, powdery mildew and Botrytis. Some parasites can be troublesome if they are many, but natural enemies regulate vineyard bio attacks.

Only varieties interspecific are little or no sensitive mildew and powdery mildew and require, under the conditions (near vineyards, wetlands), that 0 to 2 treatments before and after flowering.

Varieties" classic" require 3 to 12 treatment according to climatic conditions. These parasitic diseases are related to algae/mushrooms that develop in wet conditions. The dry areas are little concerned.

5-1-The fungal diseases:

5-1-1-Mildew:

- **Definition, symptoms and damages**:

Mildew of the vine is a disease originating in North America, which was observed for the first time in France by **(SIMON et al, 1992).**

It is due to a microscopic fungus: *Plasmopara viticola*, which develops on all plant organs: branches, leaves, clusters and tendrils **(REYNIER, 2003).** The attacks cause a loss of 80% of the harvest **(BLOUIN, 2005).**

It Product first tasks yellowish say tasks oil **(DUBOS, 2002).**Then the underside of the sheet is covers felting white. Finally, areas grilled appear on the sheet. On clusters, it leads browning grain and then drying. The contamination has just outside, mildew do nothibernate on the vine.

- **Treatment:**

It must cover the period from 15 May to harvest. It is carried out in general with copper sulphate, to due to 15 g per liter of water.

We prefer the copper oxychloride, softer for bees, to due to 20 g per liter of water. (Concentration: 0. 2%), hydroxides copper associated with derivatives terpene allow to divide the contribution of copper by 2. The treatment must be renewed about all 10 -15 days and in any case as soon as it was leached by 25 to 30mm rain. In case of strong attack only, a final treatment takes place mid-August to later, for varieties ripe in October, earlier for other. It is indeed comply with a period of 6 weeks between the last treatment and picking/ vintage

5-1-2-Powdery mildew:

- **Definition, symptoms and damages:**

Powdery mildew is a disease originating in American north **(DUBOS, 2002).** It appeared in France in 1845 **(REYNIER, 2003),** due to a fungus: *Uncinulanector* which it is given the name of powdery mildew (**DUBOS, 2002).**

It develops the surface of the bodies green vine. On the leaves, it produces tasks diffuse dust of a white gray **(Dubos, 2002)** .This aspect is observed also the face lower in grape varieties very sensitive **(REYNIER, 2007).**

On the branches green, the same coating dusty develops, then the branches are tasks brownish **(DUBOS, 2002).**

On clusters, if contamination takes place to flowering, grains fall, if it takes place later, the grains cover powder gray, then they burst **(SIMON et al, 1992).**

Powdery mildew hibernate on the vine, an attack a year must you warn for the following year where you are assured that the disease declare again **(BLOUIN, 2005).**

- **Treatment:**

It must be started together with the anti- mildew, but can be stopped to the ripening (in the late July). Greenhouse often used sulfur flower powder (to use outside the hot hours: risk of burns).

Outside it is more convenient to use sulfur wettable (8g per liter water before flowering and 4g per liter water after flowering) which the advantage be able, to be mixed with boiled cupric. The time use of sulfur allows dealing still a week of harvest, but the sulfur present on berries can be the cause, the formation of mercaptan at the vinification. A period of 3 weeks limit this risk.

5-1-3-THE gray mold (Botrytis):

- **Definition, symptoms and damages:**

The gray mold is a disease fungal caused by mushroom" Botrytis cinera" concern all farmers, because this fungus meeting on numerous plants **(SIMON et al, 1992).** It attacks mainly grains **(REYNIER, 2005).** These brown and rot by covering a felting gray.

These are the grape varieties to skin fine who are most sensitive **(DUBOS, 2002).** Damage are estimated from 60 to 80% **(BLOUIN, 2005).** On the leaves: the disease results in the presence of major stains brown- red on the blade, giving leaves the aspect of a sheet burned **(DUBOS, 2002).**

On the inflorescences: the fungus can cause the dryness of flower, buds before flowering and the fall early part or all of the inflorescence **(REYNIER, 2003).**

- **Treatment:**

It is optional, but it allows having grapes healthy, even in wet year. It must be made of two times, to the 15 June and to the 10 July. The spray must be made towards the area clusters. You can use products called anti- rot you will find it at garden center.

It may limit the risk of botrytis in airing clusters. To do this, avoid that clusters not touch by cutting clusters in surplus, and remove leaves covering these clusters from the ripening to

allow airflow. Situated in a sunny, it is better to leaf through a front of the rank (that the most in the shade).

5-2-Viral diseases:

5-2-1-The short established:

- **Definition, symptoms and damages:**

The short- established is a viral disease, which can lead to the grubbing premature to the plot. There are two types of virus responsible for the disease: the GFLV (Grapevine Fan Leaf Virus), most often highlighted, and ARMV (Arabic Mosaic Virus),**(WALTER et *al*, 2000; REYNIER, 2007).**

They can be identified on vine by the serological test ELISA. It produces the same symptoms and are transmitted by the plant material or by nematodes the ground.

The nematodes vectors (Xiphinema index for the GFLV and Xiphinema diversicaudatum for the ARMV) belong to the order of Nemathelminthes or roundworms, who live sometimes-large depths.

For food, the nematode picnics the roots and transmits the virus if it is infected. He lives in the ground, up more than 1,50 m depth and can survive after grubbing of the vine for 4 to 5 years on the pieces of roots not extirpated **(REYNIER, 2003).**

The nematode do not move to more than 1,50 m away per year (evolution slow). The short-established as other degeneration or decline infectious appears by small spots within the plots. The nematodes, in spicy successively two stocks neighbors whose roots are close, inoculate the virus of the foot sick at the foot healthy.

The short- established is characterized by a weakening progressive strain, which can lead to his death.

- **Treatment:**

There is no method control curative against short- established. It’s imperative act preventive and plant in soil" free" of nematodes vectors.

Devitalized strains before grubbing. Doses use of glyphosate must be in accordance with the regulation and limited to 2880 g/ ha/ year. The destruction of roots can starve nematodes vectors Short established.

The trichlopyr can also be used for this purpose. Grubbing will take place 4 months after application in fall; take out carefully the roots after grubbing. Comply with a rest of the soil of 7 to 10 years before replanting of the vine on a contaminated soil. Use plant material certified.

Maintain the outskirts of the plot. Eliminate volunteer vine. Avoid contributions of land exogenous can be contaminated by nematodes. Disinfection soil allowed eliminating nematodes vectors Short established.

5-2-2-The winding viral the vine:

- **Definition, symptoms and damages:**

The winding leaf is one of the most important disease virus vine.It is widespread in all countries wine of the world; this disease manifests itself in summer by the winding sheets and caused by several virus neighbors the effects of which can overlap **(BOVEY et al, 1980).**

The winding do not cause the death of the vine, of vines ancient are sometimes holders of the disease for many years. Its presence often results by a decrease yields (- 10 to-40%) related to a decrease of fertility, weight clusters and force of vines achieved.

Delays maturation from 2 to 3 weeks were also observed. These delays result in contents acids higher, a decrease of alcoholic and the concentration of the polyphenol compounds (tannins and anthocyanins).

No remission of plants patients is possible. No less than eight different viruses, of GLRaV1 to GLRaV8 (Grapevine Leaf Roll associated Virus in English) have been described in combination with symptoms winding. During the infection, these viruses obstruct vessels phloem and prevent products photosynthesis to move to the berries **(REYNIER, 2007).**

- **Treatment:**

The fight against viruses winding is based, first on the selection health and use of plants certified. The clonal selection and the scheme French multiplication plant material, necessitate many controls at all levels, now allows considering our equipment national as one of safer in the world.

If necessary (selection of new clones or rescue of a variety rare, for example), techniques sanitation exist (cultures of plants in vitro, and treatment with heat therapy).They were and are still widely used as part of conservation work, evaluation and valuation of genetic diversity of the vine. In order to further reduce the risk of dissemination of the winding

through the plant material, it is important to improve knowledge of viruses and the detection techniques. In the vineyards where the scale insects vector play a significant role in the spread of winding, treatment insecticides can optionally be considered. The IFV of Burgundy currently carries out studies biological control.

5-3-Other disease:

5-3-1-The Erinose:

- **Definition, symptoms and damages:**

This problem is more and most common. This is an attack tiny mites, invisible to the naked eye, manifested by the appearance of blisters on top leaves whose underside covers felting white. Not all varieties of vines are attacked. The problem is benign, but often confused this attack with that of a fungus.

- **Treatment:**

Often the erinose disappears without intervention. In cases persistent, is carried out a spray sulfur wettable or, in emissions, a powder sulfur- flower.

5-3-2-Borer attacks:

- **Definition, symptoms and damages:**

In a few special cases, insects can attack your vine. Insecticides having a high toxicity are used after looking for natural solutions as a treatment liquid manure nettle free (nettles chopped, covered water, macerated for 24 h), a powder sulfur- flower.

- **Treatment:**

Paraffin oil for the treatment winter eggs scale insects and moths; do not spray in full sun. This product deteriorating rapidly also a secondary action against powdery mildew.

Generalities on the vine

Grape vine juice

Grape vine juice

1-Biochemistry of grapevinejuice:

1-1-Physical composition:

The vine‘s fruits (grapes)contain many berries attached to stems. The essential parts of the berry include the skin, the pulp, and seeds.The skin consists of an outer layer covering the berry. It is made up of six to tenlayers of thick walled cells. The outer surface of the skin is covered with a wax-likecoating called the cuticle, which renders the berry waterproof. The main components inthe skin are coloring matters (red and yellow pigments), tannins, aromatic substances, andpotassium and other minerals.Below the skin layer lies flesh or pulp, which makes up most of the berry volume.Cells in the pulp have large vacuoles containing cell liquid or juice. When the berry isgently crushed, the fragile cells in the pulp are broken and the juice is released. This juiceis commonly referred to as the free water .The seeds are localized in the center of the flesh. The berry contains generally two tofour seeds. They are rich in tannin, whichare extracted during fermentation(in red wines).

1-2-Chemical Composition:

Freshly expressed grape juice consists of 70 to 80% water and many dissolved solids**(POUX, 1965)**.These soluble solids include numerous organic and inorganic compounds. The importantgroup of compounds, from the winemaking point of view, include the following:

1. Sugars
2. Organic acids
3. Phenolic compounds
4. Nitrogenous compounds
5. Aroma compounds
6. Minerals
7. Pectic substances

1-2-1-Sugars:

In grapes, a large proportion of the soluble solid is sugars. Glucose and fructose are themain sugars in the juice**(POUX, 1965)**. The sugar content of the juice of ripe grapes varies between 150 to 250 g/l. In unripe berries, glucose is the predominant sugar. At the ripening stage,glucose and fructose are usually present in equal amounts (1:1 ratio). In overripe grapes, the concentration of fructose exceeds that of glucose.

Grape vine juice

In ripe grapes, there is somevariation in the glucose to fructose ratio among varieties, for example,Chardonnay isclassified as a high fructose variety.Fructose, glucose, and sucrose differ significantly in sweetness. The order ofsweetness is the following: fructose is sweeter than sucrose, which is sweeter than glucose. In otherwords, on a sweetness scale, if fructose is considered to be100, sucrose is 84 and glucose 66. That is a quite difference. This information is important to a winemaker, for example if a winemaker wishes to sweeten a wine, he will need lessfructose than sucrose to reach the same degree of sweetness.

Glucose and fructose are fermentable sugars. During the course of fermentation, theyeast converts these sugars to alcohol C_2H_5OH and carbon dioxide CO_2. The amount of alcoholproduced is related to the amount of sugar initially present in the juice; thus, bycontrolling the amount of sugar in the juice, the amount of alcohol can be control in theresulting wine. It should be noted that the relationship between sugar content and the alcoholformed is not precise. Roughly speaking, the conversion of sugar to alcohol is °Brix x=55% of alcohol in wine.

The sugar content of the juice is often expressed in terms of °Brix. The unit °Brixrepresents grams of sugar per 100 grams of juice. Commonly, it is interpreted as gramsof sugar per 100 ml of juice. The sugar content of the juice in terms of °Brix can bemeasured by a refractometer or a °Brix hydrometer. Sugar in the juice can also bemeasured by determining specific gravity. Hydrometers calibrated to specific gravityscale are often used. The relationship between °Brix and the specific gravity value is inthe range of 15 to25°Brix and is given in Table n°2.

DegreesBrix	Specificgravity
15,5	1,06103
16	1,0675
16,5	1,06967
17	1,7185
17,5	1,07404
18	1,07844
18,5	1,07642
19	1,07844
19,5	1,08066
20	1,08667
20,5	1,08388
21	1,08733
21,5	1,08957
22	1,09182
22,5	1,09408
23	1,09634
23,5	1,09826
24	1,1009
24,5	1,1032
25	1,1055

Table n°2: The relationship between °Brix and specific gravity value in grape juice.

1-2-2-Organic acids:

Next to sugars, organic acids are the most abundant solids present in grape juice**(OLIVIER, 1977).**They are very important components of juice and wine. They are responsible for the tarttaste and have a marked influence on wine stability, color, and pH. The principal organicacids found in grapes are tartaric, malic, and to a small extent, citric. Many other organicacids, including amino acids, are also found in juice and wines, but tartaric and malic acidaccount for over 90% of the total acids present during the early period of berry growth.

Concentration of both acids increases early in the fruit but with the onset of ripening, as the sugaraccumulates in the fruit, the acid concentration decreases. Generally, the reduction

inmalic acid is greater, and consequently, at maturity, the fruit contains more tartaric acidthan malic. Grapes are one of the rare fruits that contain tartaric acid. It is present as free acid and salt, such as potassium bitartrate. Bitartrate is an important constituent since it affectspH and the cold stability of the wine.

The acid composition of grapes is influenced by many factors such as variety,climatic region and cultural practices. Generally, in ripe grapes the acid levels are lowerin a warmer climatic region than in a cooler region. The acidity is expressed as titratableacidity (TA). It is an important parameter used in quality evaluation of juices and wine.Acid content of the juice has an important bearing on juice and wine pH. Acids upondissociation liberate H+ ions, which are measured and expressed in terms of pH.Thusacidity and pH are related. However, the relationship is neither direct nor predictable.Due to the presence of various kinds of acids and their salts, the relationship betweenacidity and pH is a complex one. Understanding the role of pH in winemaking is crucialto making good wines.

1-2-3-Phenolic compounds:

Phenolic compounds are important constituents of grapes and wine. Following sugarsand acids, they are the most abundant constituents present in grapes. Phenolic compoundsare a group of substances that are structurally diverse and are present in various amounts.They play a vital role in determining the wine's color and flavor. They are involved inbrowning reactions in grapes and wines and also play a key role in the aging andmaturation of wines.

The phenolic substances are primarily located in the seeds and skins of the berry. Thejuice contains a very small amount (3 to 5% of total phenols). White wines are usuallyproduced from juice with little skin and seed contact. Their phenolic content is low, inthe range of 100 to 250 mg/lgallic acid equivalent (GAE). Red wines, on the otherhand, are customarily produced with skin and seed contact. Depending on the length ofcontact time, the phenolic content of a red wine generally varies between 1000 to 3500mg/L GAE(**BOURZIX et AL, 1983).**

The two main substances included in this group of compounds are anthocyaninsand tannins. Anthocyanins are pigments and they are responsible for the red andpurple color of the grapes and wines. They exist in both colored and colorless forms.In young red wines, most of the colored anthocyanins are present in free(uncombined) forms. As the red wine ages, the anthocyanins combine with otherphenolic compounds. In a combined state, the pigment contributes to color stabilityin red wines.

Tannins are very complex compounds. They are large molecules with a molecularweight over 500. They are yellow, brown, and red colored. They are astringent andbitter. During processing and aging, the tannins polymerize. Polymerization leads toincreased molecular size.Generally smaller molecules are more bitter than astringent. As the molecular sizeincreases (due to polymerization), the astringency is perceived more than the bitterness.Increase in molecular size makes these compounds insoluble, consequently, they precipitate,and the wine's astringency decreases.

1-2-4-Nitrogenous compounds:

Grapes contain various nitrogenous compounds. These include ammonium cationsand organic nitrogenous compounds: such as amino acids, peptides, and proteins. Thenitrogen content of the grape varies with variety, climate, soil, fertilization, and othercultural practices. The total nitrogen concentration of the fruit increases during thematuration period**(OLIVIER , 1977).**

Nitrogen containing compounds are important because they serve as the nutrient foryeast and lactic acid bacteria. Nitrogen influences biomass formation (cell populationor cell yield), rate of fermentation, and production of various byproducts, which in turnaffects the sensory attributes of wine. Proteins (nitrogenous compounds) are involvedin wine stability. Insufficient nitrogen in must can cause a sluggish or stuckfermentation and the formation of a "rotten egg" (H_2S) odor. To avoid such a problem,the must is often supplemented with diammonium phosphate (DAP). The maximumamount of DAP addition legally allowed is 8lbs/1000 gal or 958.7 mg/L.

1-2-5-Aroma compounds:

Many volatile odorous compounds are found in wine. These aromatic substancesare derived from three major sources:

1. Grapes (fruits)
2. Fermentation
3. Aging and maturation

Grapes contain numerous flavor compounds. Some of these compounds have beenreported to give a variety their distinct varietal character. Examples of these include:

A-a-2-methoxy-3-isobutyl pyrazine - Predominant compound giving bell pepper-likeodors to varieties like Cabernet Sauvignon and white sauvignon.

B-4-vinylguaiacol and 4-vinylphenol - giving spicy, clove-like and medicinal odorsto some Gewtirtztraminer wines.

C-Terpenes - in muscats and Riesling grapes.

Many varieties such as Chardonnay do not appear to have distinctvarietal odors that can beattributed to one or two compounds. It is possible that in such varieties, many compoundscontribute to the flavor.The odorous compounds in grapes are largely present in the skin and the layers ofcells immediately beneath it. Their concentration (flavor compounds) tends to increaseduring ripening. It is important that the grapes be harvested when the flavor is at its peak.Many factors affect the concentration of aroma compounds in grapes. Manipulation and

control of these factors is necessary for attaining the desired flavor level at harvest.

1-2-6-Minerals:

The vine takes up minerals from the soil. The minerals usually account approximately for0.2 to 0.6% of the fresh weight of the fruit. The important mineral compounds include:potassium, sodium, iron, phosphates, sulfate, and chloride. Among the mineral compoundsmentioned above, potassium is the most predominant mineral. It accounts for 50 to 70% ofthe cations in the juice. During ripening, the potassium content of the grape increases. Itsmovement into fruit leads to the formation of potassium bitartrate, which reduces theacidity and increases the juice ph. It should be noted that the tartaric acid, salt of potassiumis involved in wine instability problems.

1-2-7-Pectic Substances:

Pectic substances are cementing agents present in the cell wall. Chemically, they arecomplex polysaccharides made of galacturonic acid molecules linked together. Duringripening, pectin is hydrolyzed by naturally occurring pectolytic enzymes, which rendersthe berry softer as it ripens. In juice, the pectin causes cloudiness by holding the particlesof fruit pulp in suspension. To allow the suspended solids to settle and clarify the juice,commercial preparations of pectolytic enzymes are often used.

2-Pre-harvest factors influencing grape juice quality:

Grape vine juice

Among major pre-harvest conditions that influence quality of grape juice are climate, soil, cultivar, vineyard management and maturity. Each of these factors exerts its owninfluence, but complex interactions among these factors must be kept in mind.

2-1-Climate:

The maximum, minimum and average temperatures as well as the daily pattern of heataccumulation and solar energy level have to be considered in looking at the overall site(**SPAYED and MORRIS, 1978**). Rainfall, clouds, fog, and their distribution through the season are important along with other water and solar factors.

2-2-Soil:

Loose soils with moderate fertility and excellent drainage characteristics are best. Thisideal situation and all conditions that vary from the ideal require different vineyardmanagement systems to obtain maximum juice quality.

2-3-Cultivar:

Concord is the grape cultivar most widely used for juice production and the UnitedStates accounts for the vast majority of the world's Concord production. It is a rare grapecultivar that can produce juice with a balance of sugars, acids, flavouring substances,astringent characteristics and aroma as palatable and as well recognized by the consumer asConcord juice **(MORRIS, 1987)**. Also, the highly flavoured concord grape juice imparts a richflavour after dilution and sweetening.

Other cultivars for dark juice are Fredonia, Van Buren, Sheridan, Ives and Clintonnes.Sunbelt is a new cultivar released from the Arkansas Agricultural Experiment Station. It hasproven to be an outstanding juice grape cultivar in southern or warm production regions.Among white grapes, Niagara has become the standard for juice because of its unique aromaand flavour. Commercially, Niagara is usually blended with the less expensive and neutralThompson Seedless juice from California. Cold-pressed Catawba, Isabella, Ontario andSeneca have been used for white juices, usually blended. California has greatly increased theirproduction of grape juice concentrate, a great deal of it being the *Vitisvinifera* type.*Vitisvinifera* grapes are the most widely planted grape cultivars in the world.

The juice of muscadine grapes (Muscadiniarotundifolia) has a unique bouquet. It isappreciated by people in the southern part of the United States of America, where it is nativeand its flavour is well known by consumers. Cultivars vary in colour from almost white

topink, red, blue, purple and nearly black. Blends have a beautiful colour and a refreshing taste**(MORRIS, 1982).**

2-4-Vineyard management:

Pruning and training systems, fertilization, irrigation, application of growth regulatorsin addition, pest control measures are vineyard management operations that can influence juicequality. Maintaining an adequate and balanced mineral nutrition program is a major factor inproducing high fruit yields and quality grapes. It is not uncommon to create fruit qualityproblems with excessive nitrogen fertilization that results in excessive vigour and subsequent

fruit shading. Also, excessive potassium (K) can result in quality problems. Excessive levels in the juice were detrimental to fresh juice colour quality and stored juice colourstability, making a balanced K fertilization program highly important in vineyardmanagement of grapes.

3-Harvest and postharvest factors influencing grape juice quality:

MORRIS, (1987) found that in harvest maturity, the flavour and sugar/acid ratio ofConcord juice was directly related to maturity, making harvest dates crucial determiners ofjuice quality. Most grapes used for juice are mechanically harvested. It was shown thatmechanically harvested grapes are of better quality than hand-harvested grapes. Effects on thequality of machine-harvested grapes can be altered or influenced by six major factors:

- Type of machine
- Cultivar
- Production system
- Harvest temperature
- Interval between harvesting and processing
- Postharvest handling system.

Muscadine grapes present a major problem for once-over machine harvesting, since,unlike other commercial Vitis species, many cultivars of muscadine do not ripen uniformly.The presence of immature fruit in an once-over harvest is undesirable, since it lowers thequality of the processed product**(MORRIS e*t al*, 1979)** developed a system for sortingmachine-harvested muscadine grapes into maturity classes using a density sorting system. Itprovided a rapid and inexpensive way of removing fruit of undesirable maturity.

Grape vine juice

The ease ofberry detachment from clusters, spherical shape of the muscadine berry and relatively smallvariation in fruit size characterizes it as ideal for mass density sorting.

4-Processing factors that influence quality:

Colour is one of the most important qualities of grape products. A typical purple-red is associated with high quality 'Concord' grape juice or other red grape juice, but changes incolour from purple-red to brown during processing and storage cause a drastic decline inquality. This is true of all cultivars and species of grapes. The red muscadinegrapeanthocyanin pigments are extremely unstable under conventional warehouse storagetemperatures **(MORRIS and *al*, 1982).**

The increase in soluble solids of 'Concord' grapes from 14 to 18ºBrix during maturityusually corresponds to an increase in colour. After grapes reach 18ºBrix, colour quality maydecrease. With *Vitisvinifera* cultivars, the colour will continue to increase up to 22 to 26ºBrix. This condition I cultivar-dependent. The development of the typical purple-red colourin 'Concord' grapes begins at veraison (time at which berries commence to ripen) and continues**(Morris and al, 1973).** However, as the pH of 'Concord' grapes getsto 3.7 to 3.8 or higher, a change in the pigment occurs which results in a colour shift frompurple-red to blue. Therefore, it is important to harvest at a low pH (3.3 to 3.4) to maintainstable colour in processed juice.

Extraction temperature influences juice colour by affecting the activity ofpolyphenoloxidase (PPO), which accelerates the rate of degradation of anthocyanins (colouringredient) in crushed grapes. Inactivation of PPO by heat prior to depectination prevents lossof anthocyanins during extraction and subsequent storage. Storage temperature and time areprimary factors for stability of colour in long-term storage. Research studies have shown thatmaturity, total acidity and juice storage time affect the amount of tartrates or argols in grapejuice. The percentage of total phenols are increased in less-mature grapes and at highextraction temperatures **(MORRIS and *al*, 1973).**

Increased storage time is detrimental to juice quality. Studies showed similar results for'Concord' and muscadine grape juice **(MORRIS, 1987).**Juice from mature grapes hadbetter quality initially than juice from less mature grapes but declined in quality more rapidlyduring storage. Storage at 35°C resulted in a more rapid loss of quality than storage at 24°C.

Many studies and trials have been conducted to develop and determine the acceptanceof grape juices and grape juice blends from new cultivars. Theeffect of maturity and carbonation on muscadine grape juice.

Asensory panel preferred the late maturing juices with high muscadine character and low phenolic and acid levels.Carbonated juices were lighter in colour but preferred equally to non-carbonated juices.Muscadine juices have been mixed with other popular grape juices, cranberry juice and applejuice for unique blends **(SISTRUNK and MORRIs, 1985).** The dark juices were highly acceptableandretained their colour and flavour quality during a 12-month storage period. The lightestcombinations (lighter muscadine with apple and 'Niagara' grape juice) were rated highest andremained stable during storage.

One study investigated the effects of amelioration and carbonation on five wine grapecultivars processed for juice **(RATHBURN and MORRIS, 1988).** The juices with adjusted sugarand/or acid rated higher in flavour than those without the adjustment. Carbonation improvedthe ratings of the unadjusted juices but generally had no effect on adjusted ones. Two winegrape cultivars, Aurore and Verdelet, produced juices that rated comparable in flavour to'Niagara', the white juice industry standard.

Later studies evaluated consumer preference tests on blueberry juice blended withwater and with three different grape juices. On the hedonic scale used, a majority of the panelmembers ranked the flavour and colour of all four blends in one of the "like" rankings. TheBlueberry-Concord blend had the highest ranking for flavour. Blueberry juice blends havebeen formulated and marketed as a result of this study. There is an excellent market for juiceblends that use grape juice as a major ingredient.

5-Juice production:

There areseveral options for juice extraction and subsequent treatment. Methods for commercialpreparation of grape juice have undergone continuous change. In most commercialoperations, the continuous pressing method is used. Hot pressing is appropriate for deeplypigmented grapes where maximum colour extraction is desired. Whereas, the immediate orcold press procedure is necessary to maintain the initial colour of light coloured grapes.

Grape vine juice

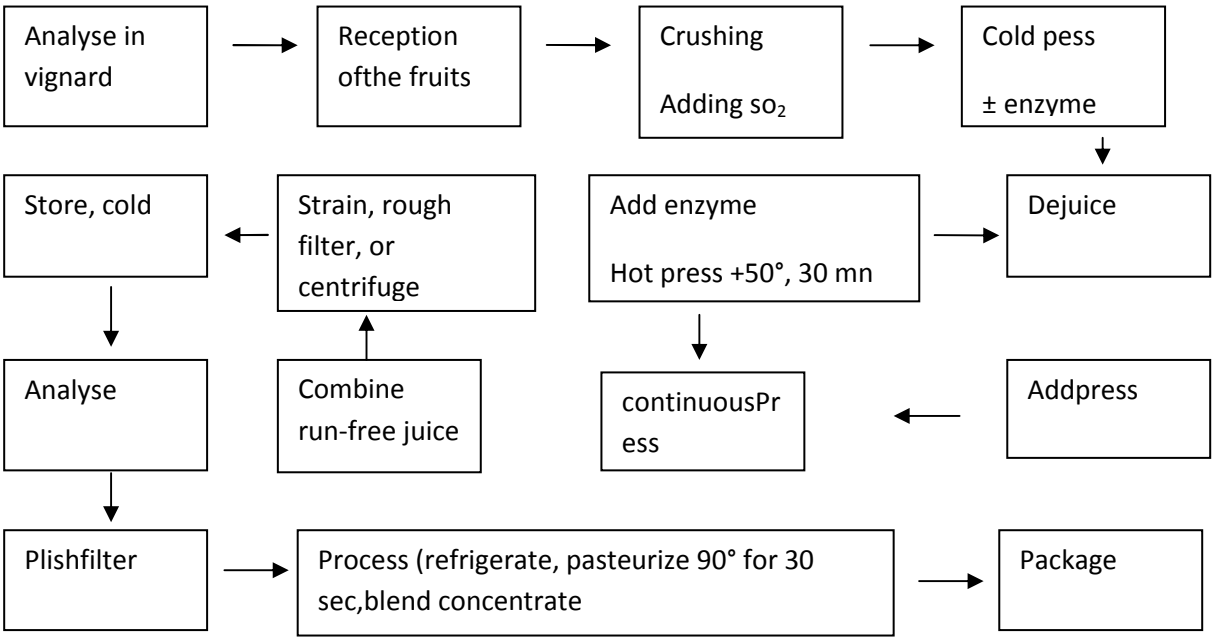

Figure N°1: Grape juice manufacture flowchart.

5-1-Hot press:

Hot-press juice production involves the addition of a pectolytic enzyme to break downnaturally occurring pectins and it uses paper pulp or rice hulls as press aids to facilitateextraction of juice. A hot-press method yields more juice that contains highertotal solids, more non-sugar solids, tannins, pigments and other substances than a cold-press juice operation.

Figure N°2: Hot press enzyme treatment.

During hot pressing, the temperature and time in processing can be variedwithin a range to produce juice with a uniform colour from grapes harvested throughout theseason. Excessive extraction temperatures (exceeding 65°C or 150°F) must be avoided topreserve juice quality.

Figure N°3: Grape stemmer/crusher.

Harvested grapes are dumped into a hopper andtransported by augers or pumps to a rotary stemmer-crusher that separates the fruit from thestem. The crushed berries are pumped through a steam-jacketed, vacuum preheater in whichthe pulp is heated to 60 to 63°C and passed into holding tanks. At this point, slow-moving agitators mix pectolytic enzyme and ~7

Kg of purified paper pulp (as a press aid)into each 1 000 Kg (metric tonnes, MT) of grapes. It takes between 30 and 60 minutes for theenzyme to break down the pectin to make the grape pulp ready for pressing. This part of theprocess helps to extract colour from the skins into the juice **(SISTRUNK, 1976).**

Next, a dejuicer removes 30 to 35 percent of the free-run juice through a 40-meshscreen. The remaining pulp empties into a continuous screw press. The free-run juice may have as much as 20 to 40 percent suspended solids and is combined with the pressed juice that mayhave only 5 to 6 percent. The combined juices have most of the soluble solidsremoved by rotary vacuum filtration, pressure leaf filtration or centrifugation. This process yields approximately 820 L of juice per MT of grapes. Anadditional 40 L of juice (after the juice and water have been concentrated) may be obtained ,140 by breaking up the press cake, spraying it with hot water and re-pressing. (This operationinvolving the addition of water to extract additional soluble solids is not permitted in tablewine manufacture).

Grapes are unique from other fruits in that after juice extraction, the argols (potassiumbitartrate, tartar in crude form) and tartrates must be precipitated. Otherwise, the argols willsettle out upon cooling or even when filtered juice is refrigerated. These crystals, althoughharmless, are aesthetically unpleasant and can be mistaken for glass fragments. Thus toaccomplish detartration (cold stabilization), the filtered juice is flash-heated at 80 to 85°C in tubular or plate-type heat exchanger, rapidly cooled in another heat exchanger to -2.2°C andplaced in tanks for rapid settling of argols. Seeding with bitartrate crystals and ion exchangemethods exist to accelerate the cold stabilization step. The final processing into asingle-strength juice or concentrate can occur once the argols have settled and the juice isracked off. The sediment can be filtered, resterilized and stored to allow the argols to settleagain for optimal recovery of juice. The juice is now passed through a heat exchanger (heatingit to 77°C) into an automatic filler and then into preheated bottles. The bottles are capped,pasteurized at 85°C for 3 minutes, cooled and labelled. In newer operations hot fill intoplastic or aseptic packing are increasingly the methods of choice in grape juice processing although glass bottles still present a quality image.

5-2-Cold-press:

The major difference between this method of juice production and the hot-pressmethods are the steps that allow for heating of the crushed berries to 60 to 63°C and holdingin tanks with pectolytic enzymes. Without these steps, the dark colour from the dark-skinnedgrapes is not adequately extracted and the juice is a lighter colour. However, light colouredgrape cultivars,

lacking skin pigment and yielding a light green to yellow juice, cannot be hotpressed. Enzymes may be added to the cold-press juice to facilitate the clarification andfiltration process following cold stabilization. However, extended contact time or hightemperatures must be avoided to minimize enzymatic browning and undesirable colourextraction. In addition, about 100 ppm of SO2 should be added to minimize browning. Juice yieldsfrom this method of processing may be only 710 L/MT, depending on the cultivar andpressing efficiency. In view of the tough skin and pulp, bronze muscadine grapes may onlyyield about 560 L/MT when processed using the cold press method.

6-The main European producers of pure grape juice:

The French production of pure grape juice stood at a little 80M liters developed mainly for juice red from grapes of Languedoc- Roussillon. Half or 40 million liters, is conditioning as grape juice, the rest is integrated in mixtures of fruits (cocktails). More than 50% of the French production is exported throughout Europe. The European makers of pure grape juice are mainly based in France and Italy. These companies have production capacities by volume of more than one million hectoliters. Some companies, mainly Italian, in addition to other main activities practice low prices on mass markets with high volume. Others, as FOULON SOPAGLY, are dealing, with pure grape juice, ofmedium and high- quality.

Materials and methods

Materials and methods

1-Materials and methods:

The purpose of our work is a comparative study between a pure grape juice and a grape juice based on a concentrate. These experiments werecarried out at the:

- Laboratory of research and development of the ElaFruitsunit at Akbou.
- Laboratoryof Microbiologyof the ElaFruits unit at Akbou.
- Laboratory of Food Technology, Department of agronomy at the University Mouloud Mammeri Tizi- Ouzou.
- Joint Laboratoryof physicochemical Analysis of the faculty of Agricultural and biological sciences of the University Mouloud Mammeri Tizi- Ouzou.

The principle of our study is as follows:

1. Research about the basic information on the variety used and grape juice included the importedjuice concentrate.

2. Manufacture of a pure grape juice froma white variety.

3. Manufacture of a grape juice based on a concentratebased whitegrape.

4. Making a tasting test to judge the characteristics and acceptability of our product, and at the end to assess the sensory differences between the two products.

5. Physicochemicalanalysesof the two juices to assess the values of each parameter.

6-microbiological analysis (presence or absence of germs, mold ...).

1-1-plant material:

The prepared juice was obtained from the grape variety Rochelle; a Spanish white variety.

1-1-1-grapes:

During our present study, we used grapes of the variety Rochelle (white variety from Spain). This fruit was mainly selected for its wealth of simple sugars (glucose, fructose), and according to **COUVREUR et *al*, (2000)**; white grapes are one of 100 foods containingmuch levels of simple carbohydrates. We used white grapes for the preparation of the puregrape juice to be comparedwith a grape juice made from on a concentrated form.

Materials and methods

How we extracted the grape juice and what are its characteristics?

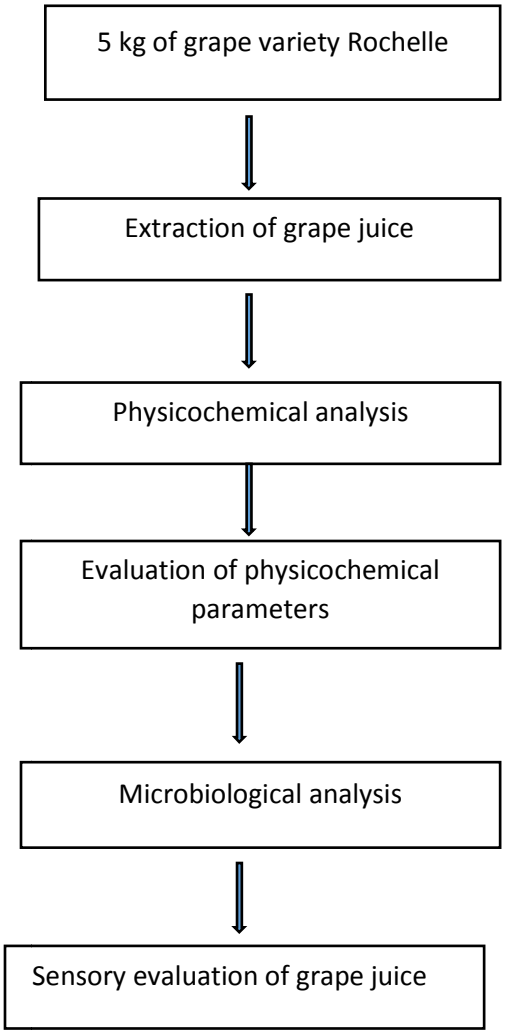

Figure n°4:steps of extraction, analyses and quality assessment of the grape juice

Materials and methods

1-2-manufacture of the pure grape juice:

At the laboratory, grapes were selectedand onlyhealthy berries were used for the grinding step.The berries were washed with plenty of water before grinding(Figure 5 and 6).

Figure n°5: Grinderwith 0,5 mm overtures

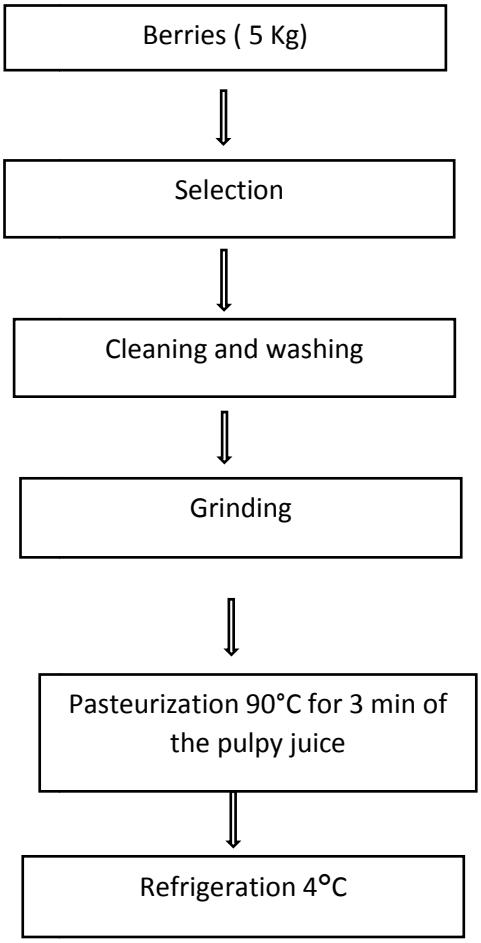

Figure n°6: The steps for obtaining a pure grape juice

1-3-grape juice based on a concentrate of white grapes:

1-3-1-The concentrate juiceof white grapes:

For these experiments, weused the concentrated whitegrape juice imported from Germany by the unit Elafruits of Akbou.This concentrate supplied by the Wild companyhas aBrix value of 64°B.

Figure n°7: Concentrate of whitegrape juice

1-3-2-Preparation of the grape juice based on the concentrate:

To prepare our juice, we used the following formula that indicates the factor of solubility

$$f = \frac{\textbf{Brix concentrated}}{\textbf{Brix juice pure}}$$

1° factor for the concentrated and the rest is water.

1-3-3- The grinding:

The grinder used has 0,5 mm overtures , and it can separate simultaneously and isolate the pulp and the seeds. The juice recovered wasstored at cold in bottles covered with aluminum sheet and labeled to distinguish between the 2 juices the pure and fresh and grape juice based on the concentrate (Figure 8).

Figure n°8: The grape juice made from the concentrate (left) and the freshpure juice (right).

2- Physicochemicalparametersstudied for two juices: pure grape juice and a grape juice made from the concentrate:

The physicochemical analyses(pH, °Brix...), the determination of the biochemical and active components(phenoliccompounds, flavonoids), were accomplished atthe laboratory (R&D) of the unit Elafruits and at the laboratory of biochemical and of the faculty of agriculture and biological sciences UniversityMouloud Mammeri Tizi Ouzou (UMMTO).

2-1-Physical parameters:

These two juices were analyzed for the following parameters:

-The pH value

-The Brix value

-Titratable acidity;

-The amount of reducing sugars;

-The viscosity.

2- 1- 1-Determination of pH:

The PH is defined as the logarithm negative of the hydrogen ion concentration. PH=- log10 [H+] .the pH of grape juice is measured using a pH meter**" HANNA" Friedrich, 2001).**

Figure n°9: PH meter" HANNA".

- **Principle:**

The pH is measured using an electrode glass, including the potential varies depending on the concentration of hydrogen ions. This potential is measured in relation to a reference electrode using a potentiometer, high impedance commonly known pH meter**. C. E. a. E. Q(2014).**

2-1-2- Determination of Brix:

The Brix translated the rate ofsoluble dry matter, contained in 100ml of an aqueous solution. This parameter is measured using a manual refractometer <<SCHMIDT>>.

Figure n°10:manual Refractometer indicating the Brix : ACT RB 32

- **Principle:**

It consist of the measuringof the refractive index of the sample, prepared at a temperature of 20°C, and then carried out conversion of this index to drysoluble residue. The latter, determined by refractometer (Fig n°10-11), expresses the concentration of sucrose of the aqueous solution with the same refractive index that the product analyzed, under determined

conditions of preparation and temperature. This concentration is expressing as a percentage by weight(**AFNOR, 1986).**

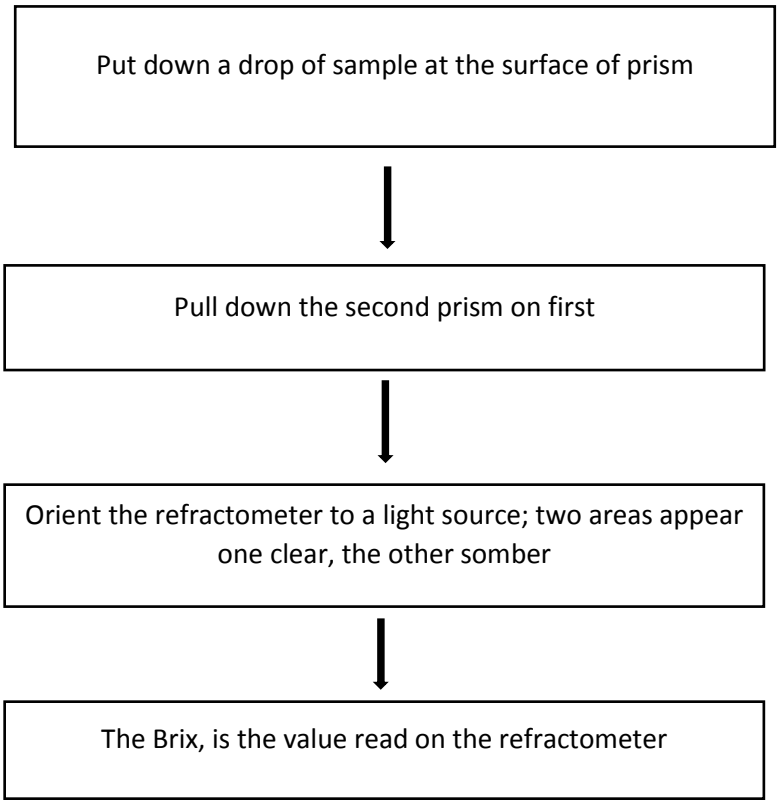

Figure n°11: Stepsbefore measuring the Brix of the pure grape juice and grape juice made from the concentrate**(AFNOR, 1986).**

- **Expression of results:**

1° Brix= 1g of sugar in 100g of solution

2-1-3-Determination of titratableacidity (AFNOR, 1986; OIV, 2011):

The acidity of the drinking solution or beverage is mainly due to citric acid. The titratable acidity is due to the sum offree mineral and organicacids.

- **Principle:**

The analysis is a titration of the acidity of an aqueous solution of each sample with a solution ofNaOH0, 1N in the presence of phenolphthalein as a color indicator.

- Taking 5 ml of grape juice in a beaker and complete up to 250ml with distilled water, then heat till t boiling to degaze.

- to a volume Vo=25 ml, we added 0,25 to 0,5 ml of phenolphthalein and while stirring, from a burette we titrate with NaOH(0, 1N) until appearance of a pink color persistent for 30 seconds and we noted the volume of titration of NaOH which colored the solutionon the graduated burette.

- **Expression results:**

Acidity titratable = 250/ 25* V1/ 10* 100/ V0 (meq/ 100ml)

V0: Is the volume, in ml, of the test sample.

V1: is the volume, in ml, of the hydroxide solution 0, 1N.

It is also possible to express conventionally titratable acidity in grams of acid per liter of Product, by multiplying by the factor corresponding to the acid**(see Table in annex)**.

2-1-4-The viscosity:

The viscosity of the juice was measured by aviscometer with ball.

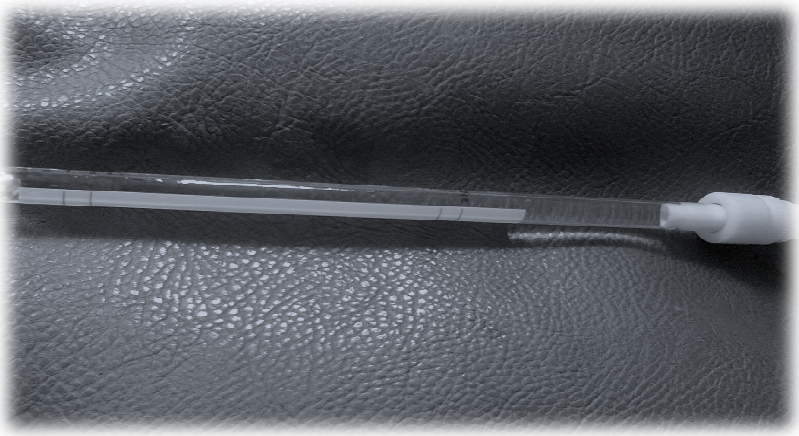

Figure n°12: viscometer with balls.

The cylindrical tube was cleaned, dried and filled with the solution. The ball with a known volumic mass was introduced inside. The screw cap was placed. We noted the time in minutes taken by the ball in the viscosimer placed in a vertical position to reach the bottom line.

2- 2- Chemical parameters:

2- 2-1-The reducing sugars (AFNOR, 1986; OIV, 2011):

- **Principle:**

The reducing sugars have the property to reduce hot and alkali blue copper sulphate in cuprous oxide, which gives red brick precipitate.

$2Cu^{++} 2é + 2H+ + O \longrightarrow 2 Cu^{+} + H2O$

This method allows quantifying the content of reducing sugars. It is necessary to know the volume of sugar solution necessary to discolor a Fehling's solution, to which we added two or three drops of bromothymol blue, and it is, constantly, maintained at boiling.

This volume is, inversely, proportional to wealth of sugar.

- **Expression results:**

The amount of reducing sugars is given by the following formula:

SR (g/ l) =[240/ v (v2 0, 05)]* 10

Or: V= Volume of the sample juice or 20ml

V1= volume of filtrate in ml which reduced the Fehling's solution.

3-Microbiological analysis:

The microbiological analysis was intended to ensure that the preparedjuice has a good hygienic and commercialquality. All the germs to be studied are summarized in the table below:

Germs	Nutritive medium	Temperature of incubation	Duration of Incubation
Total germs	V.R.B.L	30°C	72 h
Totalcoliforms	P.C.A	30°C	48 h
Yeast and mold	Y.G.C	25°C	120 h

Table n°3:microorganisms studied

VRBL: Agar Lactose Bilie violet and neutral red

YGC: Yeast extract Glucose Chloramphenicol agar

PCA.

- **Principle:**

In order to achieve these analyses, we prepared dilutions of thesamples:

-We introduced 90 ml of water peptoneintotwoglass bottles of 100 ml.

- We added 10 ml of pure grape juice and 10 ml of grape juice based concentrate in each bottle.

- After 15 min, we recovered 10 ml of each solution to be introduced into sterile Petri dishes. Theseletters were incubated in a bacteriological oven at a convenient temperature.

Figure n°13: Oven and Petri dishes used in the microbiologicalanalysis

3-1-Total coliforms:

- **Technique:**
  - From the dilution, put in aseptically 10 ml in three empty Petri dishes, numbered as follows: control, 01, 02.
  - We completed afterwards each Petri plateexcept the control with about 20ml of the agar VRBL,melted and then cooled until 45°C.
  - We agitated the content to homogenize andallowed the inoculumto mix withthe agar used.
  - We allowed the Petri plates to solidify on the laboratory pallet.

- **Incubation:**

A series of Petri dishes were incubated at 30°C, for 48 hours to be used for the research of total coliforms.

- **Reading:**

The reading is useful to compare between the two Petri dishes per report to the control or blank taking into account the factors of dilutions.

3-2-Search of yeasts and mold:

- **Technique:**
  - From the dilutions, we introduced aseptically 10 ml in four empty Petri dishes prepared and numbered astwo blanks, 01, 02,).
  - We completed then each Petri plate except the control plate with about 20ml of the agar YGC,meltedand then cooled to 45°C.
  - We agitated the plate with theinoculums to mix well these latters with theagar.
  - We allowed the Petri plates to solidify on the laboratory pallet.
- **Incubation:**

A series of Petri plates will be incubated at 25°C, for 120 hours before researchof yeasts and mold.

- **Reading:**

The first reading must be done from 72 hours of incubation, we did the first reading between the two controls, and if one of them contains yeasts or mold, the analysis will be repeated.

3-3-Search fortotalgerms:

- **Technique:**
  - From the dilutions, we put aseptically 10 ml in threeempty test tubes numbered as Fig indicates (witnesses, 01, 02).
  - Then add for each tube except the blank or control about 2 ml of the agar PCA, melted andthen cooled to 45°C.
  - Make movements at the end for homogenize the content, allow to the inoculum for well mix the agar used, and bring out the gas.
- **Incubation:**

A series tubes will be incubated to 30°C, for 72 hours and will be used to research total germs.

- **Reading:**

This is to compare between the two tubes per report to the control, taking into account the factors of dilutions.

Note:

The same analysis was used for both two kind of juices (pure and the juice made from the concentrate).

4- Sensory evaluation of the two grape juices (juice pure and grape juice based on a concentrated):

4-1-Purpose of the sensory analysis:

This method‘s objective is to assesses the organoleptic quality of the two juices, involving body sensations of the consumer **(RAKOTOVAO, 1999),** which aims to develop a good product after knowing the reactions of consumers.

Sensory analysis also is considered as a tool to control the product‘s quality during the evolution of the product over time (aging, packaging and storage)**(RAKOTOVAO, 1999).**

4-2-Test of tasting(WATTS et al, 1991):

The sensory analysis is commonly used in the food industry because it is the method of the direct assessment of the quality of aproduct. Sensory analysis remains irreplaceable since it allows describe sensations perceived during the observation or consumption**(KILN, 1982).**

It is essential to have consumer opinion to differentiate the products (juices in our case). We used the profile for tasting encrypted products for grape juice samples**(see annex n°)**.

The test of quantification is to assess the intensity of several characteristics (color, aroma, taste, acidity, sugar, viscosity and general impression).

The tasting room must have easy access and far from noise with a lighting sufficient and a suitable temperature and the amount of juice served is sufficient to refer the tasting and each panel member must rinse his mouth after each tasting and will not take food withstrong fragrance like as coffee nor smoke during or before the tasting,

The number of subjects of the jury is 10. The results were submittedto **FRIEDMAN**statistical test on whether the two juices differ one from the other and to classifythem according to the following criteria: color, taste, consistency, sugar and acidity **(WATTS et al, 1991).**

4- 3- Hedonic test (WATTS et al, 1991):

It aims to determine whether consumers appreciate the productand estimate its acceptability. It is carried out (realized) at the unit Ella fruit and at the University Mouloud Mammeri Tizi Ouzou, the number of subjects is 37 distributed between the responsible, students and workers, at that time every one of these subjects give his personal opinion aboutthe proposed product(see Annex n°1).

5-Statistical Analysis:

Statistical analysis is given by software STATISTICA

5-1-ANOVA:

The analysis of variance or analysis factor are techniques to whether one or more dependent variables (called also endogenous variables or variables to explain)

(Numerical values and continuous [i.e. workforce, reports as lengths or weight, etc...] = arranged in different lines of a table) are in relation to one or more variables or

independent(or exogenous variables or explanatory variables) (arranged in different columns of a table).

Result and discutions

Results &discussion

1-Results of the sensory analysis for the two juices:

1-1 Tasting tests:

In our work, the choice of the formulation is based on the organoleptic qualities of the two prepared juices, for which we have made a testing test based on the test Friedman according to the following equation:

$$F= (12/n*p*(p+1)) *(\sum_{i}^{p}{}_{=1}R_i^2)-3n\ (p+1)$$ soient n=10, p=2

This test was created with a hedonic test in which we have assigned numerical values to the appreciations of tasters. The two juices are classified according to six parameters: color, consistency, smell (odor), taste, sugar and acidity (Table 4).

1-1-1-parameter of color:

Table N°4: classification of two juices according to the parameter color:

Subjects	Pure grape juice (J_1)	Juice made from a concentrate(J_2)
1	3	1
2	2	1
3	4	2
4	4	3
5	5	2
6	5	1
7	3	2
8	2	3
9	4	2
10	3	1
S	35	18
M	3,5	1,8

Results &discussion

Hypothesis:

H0: The two juices are generally identical according to color.

H1: The two juices are generally different according to color.

The test is bilateral.

Statisticaldecision =test of Friedman.

Let n the number of subjects or testers and p the number of products.

Fcal= 219, 8

Knowing that the total n is less than 14 and p is less than 6, comparing Fcal to the critical value end to the table of Friedman.

If $F_{cal} < F_{theo}$: H0 is accepted with the risk α and H1rejected

If $F_{cal} > F_{theo}$: H0 rejected and H1 accepted

It was:

F_{cal}= 219, 8

F_{theo}=9, 28

Fcal>F_{theo}, H1 is accepted and H0 rejected,

The two juices are generally different, so we will make a comparison between them.

Threshold of significance: It has been set at 5%.

Statistical decision:

[J1 J2] is compared to Ϭ=K[(n* p(p- 1))/ n] 1/ 2 with k(2* alpha)/(p(p- 1)) =0, 005, after reading in the table Gaussian, K=0, 7.Ϭ =0, 7* 4, 49= 3, 14.

$[J_1 – J_2]$ =17>3, 14.

According to this result, we conclude that difference between the $J_1$and J_2 is significant.

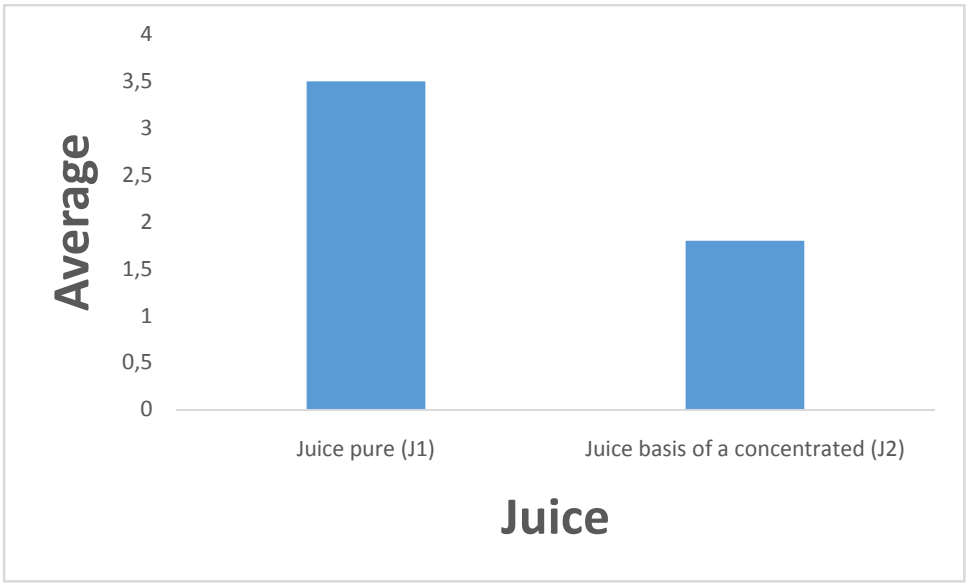

Figure N°14: classification of the two juices according to color.

We found also that the pure juice is more appreciated by the tasters.

1-1-2-parameter of consistency:

The results concerning consistency are presented in table 5.

Table N°5: classification of two juicesaccording to the parameter consistency:

Subjects	pure juice (J_1)	Juice from a concentrate(J_2)
1	3	1
2	5	1
3	4	2
4	3	2
5	4	2
6	3	1
7	3	1
8	4	1
9	5	1
10	4	1
S	38	13
M	3,8	1,3

Results &discussion

Hypothesis:

H0: The two juices are generally identical according to consistency.

H1: The two juices are generally different according toconsistency.

The test is bilateral.

Statisticaldecision =test of Friedman.

Let n the number of subject and p the number of products.

Fcal= 232,6

Knowing that the total n is less than 14 and p is less than 6, comparing Fcal to the critical value end to the table of Friedman.

If $F_{cal} < F_{theo}$: H0 is accepted with the risk α and H1rejected

If $F_{cal} > F_{theo}$: H0 rejected and H1 accepted

It was:

F_{cal}= 232,6

F_{theo}=9, 28

Fcal>F_{theo}, H1 is accepted and H0 rejected,

The two juices are generally different, so we will make a comparison between them.

Threshold of significace: It has been set at 5%.

Statistical decision:

[J1 J2] is compared to Ϭ=K[(n* p(p- 1))/ n] 1/ 2 with k(2* alpha)/(p(p- 1)) =0, 005, after reading in the Gaussian table, K=0, 7.Ϭ =0, 7* 4, 49= 3, 14.

$[J_1 – J_2]$ =25>3, 14.

According to this result, we deduct that the difference between J1and J_2 is significant.

The figure N°15 gives the results and classification of the two juices according to consistency (bad, good …).

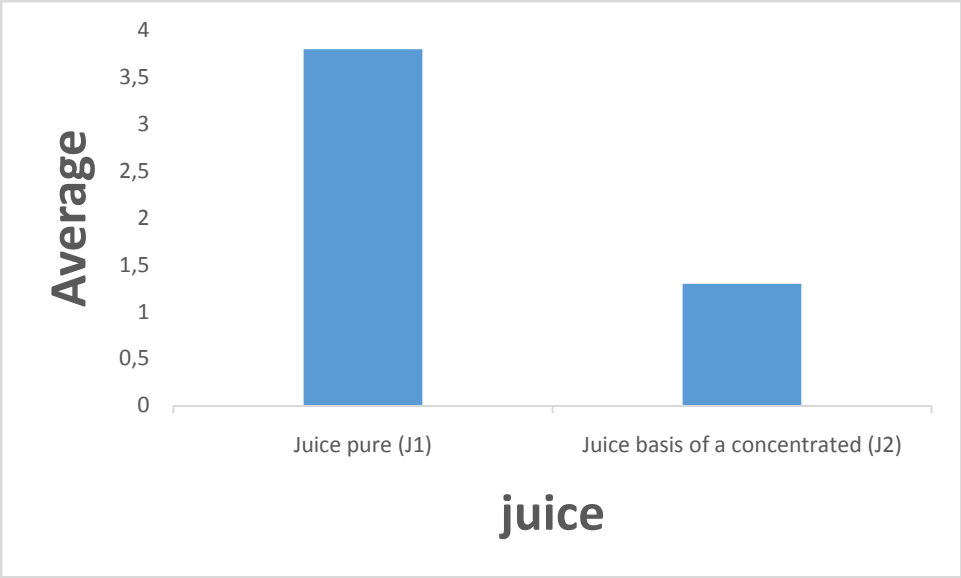

Figure N°15: classification of two juices according to consistency.

We found that the pure juice is more appreciated by the panel of tasters.

1-1-3-parameter of the smell (odor):

The results of the sensorial analysis related to this parameter are given in table 6.

Table N°6: scores of the two types of juicesaccording to the parameter smell:

Subjects	pure juice (J_1)	Juice made from the concentrate (J_2)
1	5	2
2	5	2
3	4	1
4	4	3
5	4	2
6	5	2
7	3	1
8	3	3
9	4	2
10	4	3
S	41	21
M	4,1	2,1

Results &discussion

Hypothesis**:**

H0: The two juices are identical according to smell.

H1: The two juices are different according tosmell.

The test is bilateral.

The Statistical decision will be made from Friedman test.

if n is the number of subjects and p the number of products.

Fcalculated=334,4

Considering that the total n is less than 14 and p is less than 6, comparing Fcal to the critical value end to the table of Friedman.

If $F_{cal} < F_{theo}$: H0 is accepted with the risk α and H1rejected

If $F_{cal} > F_{theo}$: H0 rejected and H1 accepted

since:

F_{cal}= 334,4

F_{theo}=9, 28

Fcal>F_{theo}, H1 is accepted and H0 rejected,

The two juices are generally different, so we will make a comparison between them.

Threshold significant: It has been set at 5%.

Statistical decision:

[J1 J2] is compared to Ϭ=K[(n* p(p- 1))/ n] 1/ 2 with k(2* alpha)/(p(p- 1)) =0, 005, after reading in the table Gaussian, K=0, 7.Ϭ =0, 7* 4, 49= 3, 14.

$[J_1 – J_2]$ =20>3, 14.

According to this result, we conclude that the difference between $J_1$and J_2 is significant.

Results &discussion

The **f**igure N°16 belowshows the classification of two juices according to smell (bad, very good …).

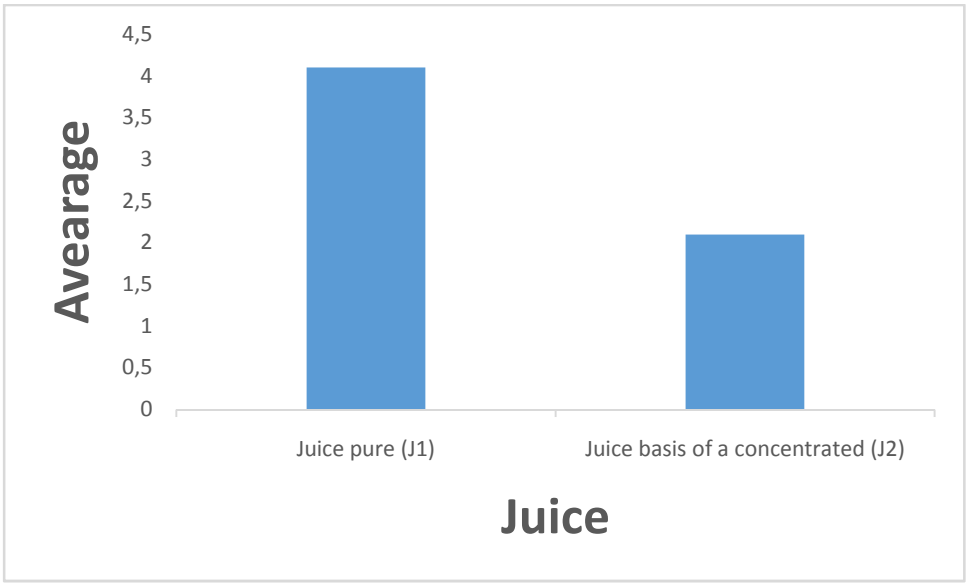

Figure N°16: classification of two juices according to smell.

We find so that the juice pure is more appreciated by the tasters.

1-1-4-parameter of the taste:

Table N°7: classification of two juicesaccording to the parameter taste:

Subjects	Pure juice (J_1)	Juice made from a concentrate(J_2)
1	4	2
2	4	3
3	4	3
4	4	4
5	5	2
6	5	2
7	3	3
8	4	3
9	3	4
10	3	3
S	39	29
M	3,9	2,9

Results &discussion

Hypothesis**:**

H0: The two juices are generally identical according to taste.

H1: The two juices are generally different according totaste.

The test being bilateral, the statisticaldecision will be made according to the Friedman test.

If n is the number of subjects and p the number of products.

Fcal=382,4

Knowing that the total n is less than 14 and p is less than 6, comparing Fcalculated to the critical and theoretical value of the table of Friedman.

If $F_{cal} < F_{theo}$: H0 is accepted with the risk α and H1rejected

If $F_{cal} > F_{theo}$: H0 rejected and H1 accepted

with**:**

F_{cal}= 382,4

F_{theo}=9, 28

Fcal>F_{theo}, H1 is accepted and H0 rejected,

The two juices are generally different, so we will make a comparison between them.

Threshold of significance: It has been set at 5%.

Statistical decision**:**

[J1 J2] is compared to Ϭ=K[(n* p(p- 1))/ n] 1/ 2 with k(2* alpha)/(p(p- 1)) =0, 005, after reading in the table Gaussian, K=0, 7.Ϭ =0, 7* 4, 49= 3, 14.

$[J_1 – J_2]$ =10>3, 14.

According to this result, the difference between J1and J_2 is significant statistically.

The Figure N°17: shows the classification of the two juices according to taste (bad, very good …).

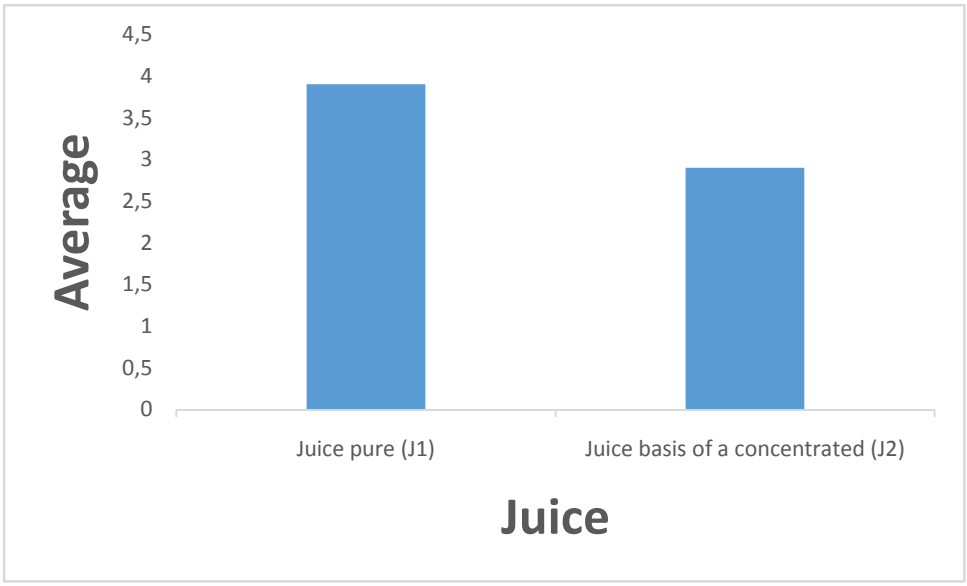

Figure N°17: classification of two juices according to taste.

We found therefore that thepure juice is more appreciated by the tasters than the juice made from the concentrate.

1-1-5-parameter of the sugar:

Table N°8: classification of two juicesaccording to the parameter sugar:

Subjects	Pure juice (J_1)	Juice made from a concentrate(J_2)
1	3	2
2	3	2
3	4	3
4	4	4
5	5	3
6	3	3
7	3	3
8	4	2
9	4	2
10	5	1
S	38	25
M	3,8	2,5

Results &discussion

Hypothesis:

H0: The two juices are generally identical according to sugar.

H1: The two juices are generally different according tosugar.

The test is bilateral.

Statisticaldecision =test of Friedman.

Let n the number of subject and p the number of products.

Fcal=395,8

Knowing that the total n is less than 14 and p is less than 6, comparing Fcal to the critical value end to the table of Friedman.

If $F_{cal} < F_{theo}$: H0 is accepted with the risk α and H1rejected

If $F_{cal} > F_{theo}$: H0 rejected and H1 accepted

The calculated and theoretical values of F are given below:

F_{cal}=395,8

F_{theo}=9, 28

Fcal>F_{theo}, H1 is accepted and H0 rejected,

The two juices are generally different, so we will make a comparison between them.

Threshold of significance: It has been set at 5%.

Statistical decision:

[J1 J2] is compared to Ϭ=K[(n* p(p- 1))/ n] 1/ 2 with k(2* alpha)/(p(p- 1)) =0, 005, after reading in the table Gaussian, K=0, 7.Ϭ =0, 7* 4, 49= 3, 14.

$[J_1 – J_2]$ =13>3, 14.

According to this result, we find that deference between the $J_1$and J_2 is significant.

The figure N°18shows the classification of two juice according to sugar (pleasant, unpleasant …).

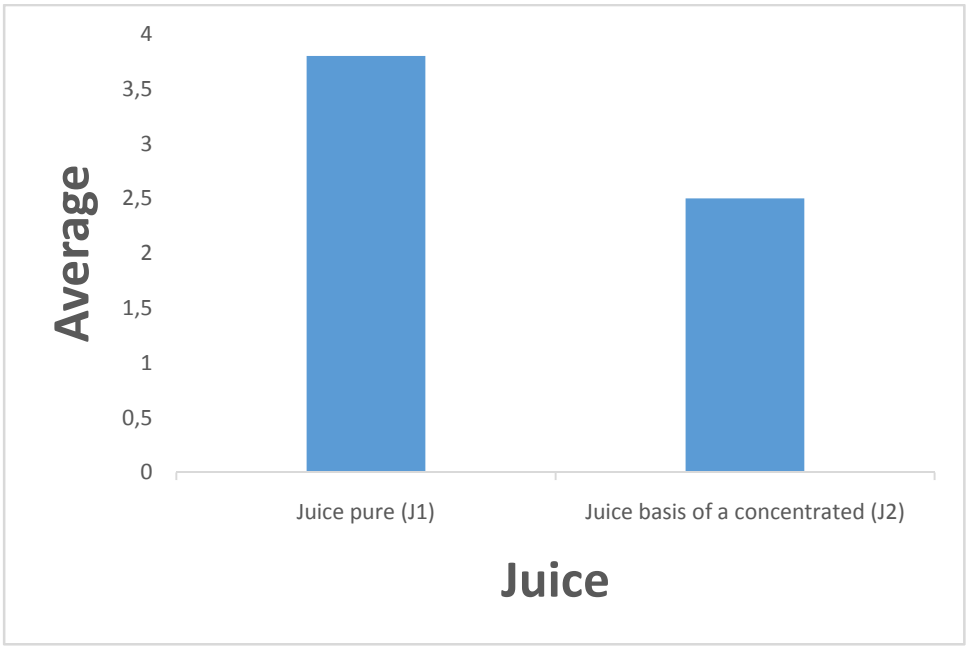

Figure N°18: classification of two juices according to sugar.

We found that the juice pure is more appreciated by the tasters

Results &discussion

1-1-6-parameter of the Acidity:

The acidity appreciation of the tasters is given below:

Table N°9: classification of two juices according to the parameter acidity:

Subjects	pure juice (J_1)	Juice made from a concentrate(J_2)
1	3	3
2	4	2
3	4	3
4	5	2
5	3	2
6	3	3
7	4	4
8	3	3
9	4	2
10	3	3
S	36	25
M	3,6	2,5

Hypothesis:

H0: The two juices are generally identical according to acidity.

H1: The two juices are generally different according to acidity.

The test is bilateral.

Statisticaldecision =test of Friedman.

Let n the number of subject and p the number of products.

Fcal=294,2

Knowing that the total n is less than 14 and p is less than 6, comparing Fcal to the critical value end to the table of Friedman.

If $F_{cal} < F_{theo}$: H0 is accepted with the risk α and H1rejected

If $F_{cal} > F_{theo}$: H0 rejected and H1 accepted

It was:

F_{cal}=294,2

F_{theo}=9, 28

Fcal>F_{theo}, H1 is accepted and H0 rejected,

The two juices are generally different, so we will make a comparison between them.

Threshold of significance: It has been set at 5%.

Statistical decision**:**

[J1- J2] is compared to Ϭ=K[(n* p(p- 1))/ n] 1/ 2 with k(2* alpha)/(p(p- 1)) =0, 005, after reading in the table Gaussian, K=0, 7.Ϭ =0, 7* 4, 49= 3, 14.

[J_1–J_2] =11>3, 14.

According to this result, we find that deference between the $J_1$and J_2 is significant.

The figure N°19shows the classification of two juices according to acidity (pleasant, unpleasant …).

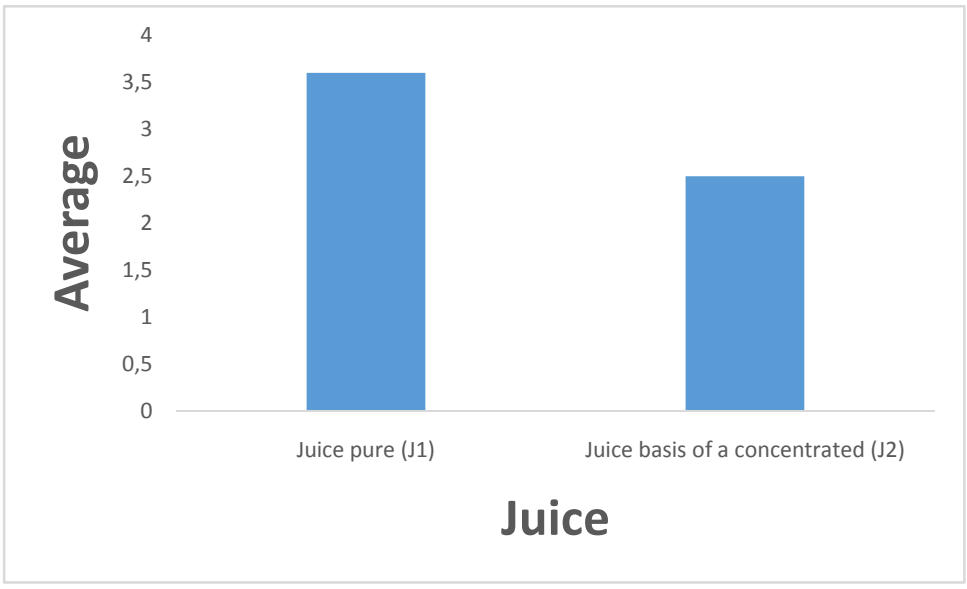

Figure N°19: classification of two juices according to acidity.

We deduct once again that the pure juice is more appreciated by the tasters.

Results &discussion

1-2 hedonic test:

The results of the hedonic testare given in the following table:

Table N°10: Results of the hedonic test.

	effective/Quotation	effective cumulative growing	
Quotation	Juice pure	Juice pure	% Juice pure
1	0	0	0
2	0	0	0
3	0	0	0
4	2	2	5,4
5	7	9	24,32
6	10	19	51,35
7	18	37	100

According to this table, the assessment ofthe pure grape juice by consumers is given according to two (2) categories of intervals quotation we have selected:

For points >=6 (characters pleasant and very pleasant): more than half have indicated that the juice pure grape is pleasant or same very pleasant.

For points =5 (characters quite pleasant): have indicated that the juice pure grape is quite pleasant.

The percentage of individuals who have given negative decision forpure grape juice are low (5, 4%).

Therefore, we can deduce that consumers enjoy thepure grape juice.

2-The physicochemical characteristics of the two juices:

The two prepared juices were pasteurized and samples in bottles were submittedto analyses as well as physical and chemical;and their characteristics are given in the following table n°11:

Table n°11: characteristics of two juices pasteurized.

Parameters	juice pure grape	Juice grape made from a concentrate
°Brix	14,69	14,44
pH	3,72	3,88
Titratableacidity	6,9	6,93
Reducing sugars	160,5	141,36
Viscosity	1,78	1,11

2-1-pH:

The PH is considered as an important parameter, for the evaluation of the organoleptic quality grapes, the sugar content and acidity, moreover during growth of the vegetation it depends on PH of the soil. The pH of grape juice is related to levels of tartaric acid and differences, which may exist come from the maturation, genetic characters of the variety used and health status without forgetting the year wine **(HUGLIN, 1988).**

For the grape juice based on the concentrate, we used a concentrate Wild known at the food industry and market and differences, which may exist, are due to the contribution of the concentrate and its physicochemical properties.

The results of pH are illustrated in Figure N°20 follows:

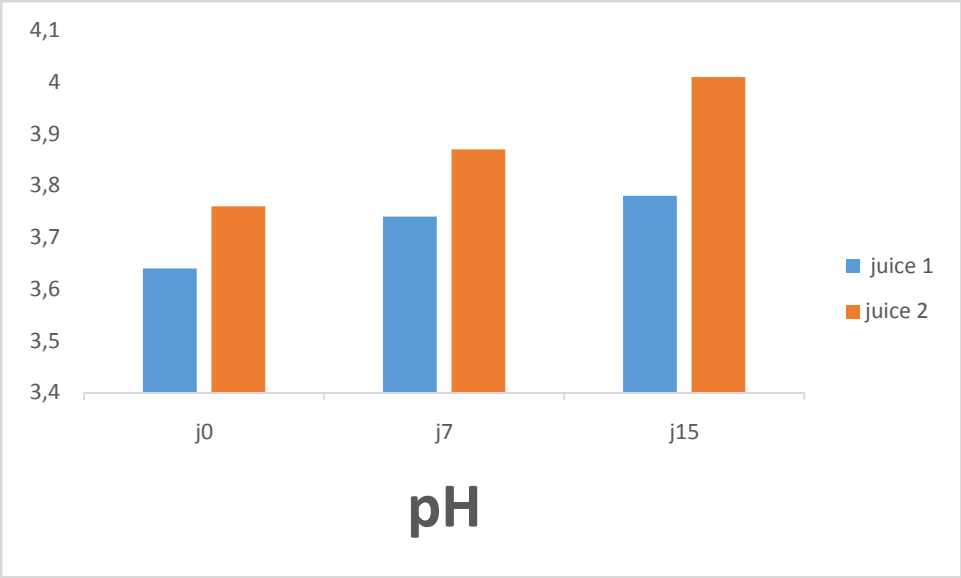

Figure N°20: evolution of PH of the two juices(pure and based on a concentrate).

According to the graph, the change in pH over time is quite important in the juice made froma concentrate and besidespure grape juice marked a slightly variation.This difference is finally related to the chemical composition of the concentrate used, and despite the differences illustrated by figure20; the ANOVA has not revealed any significant differences for both juices.

The results of pH of grape juice pure vary from 3, 64 to 3, 74; this PH acid preserves this juice against any microbiological alterations, which ensures a beneficial effect for the health of consumers(**BENAISSA, 2011**).

More the pH is low, more clarification by collage will be difficult and less chance to have bacterial attacks, and although the pH of grape juice based on the concentrate is also acid but it can never ensure the same beneficial effects.

2- 2- Titratable acidity:

The acidity titratable is the sum of mineral acids and organic free**(AFNOR, 1986).** It is expressed in grams of acid corresponding to a liter of product.

The results of the titratable acidity are illustrated in the following Figure N°21:

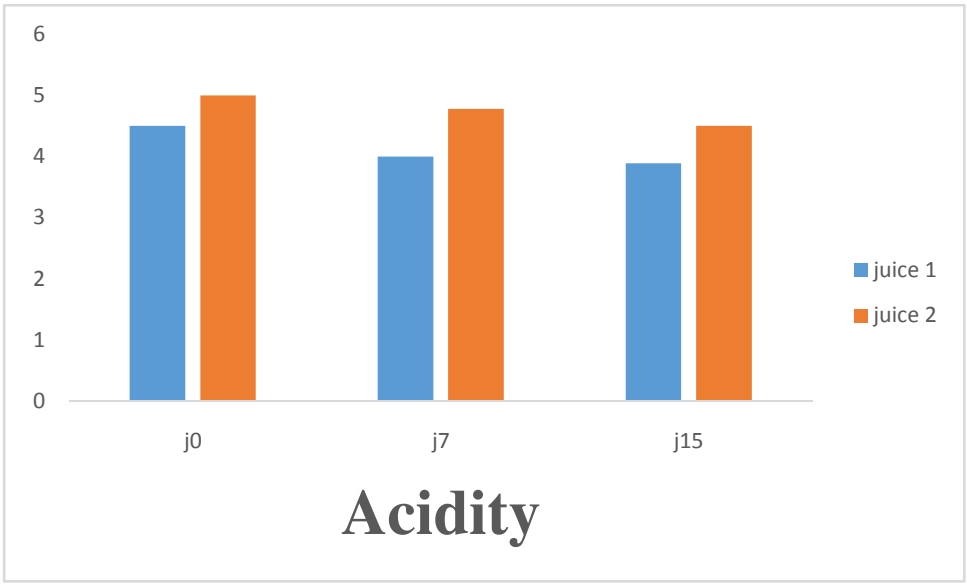

Figure N°21: evolution of titratable acidity of the two juices

According to the graph, the change intitratable acidity over time for both juices is simple. We can estimate that the pure grape juice is more acid than the juice based on the concentrate, giving it more the ability to keep its property organoleptic for a long- term and prevents any kind of bacterial alteration and influence on the stability of juice**(RAKOTOVAO, 1999).**

The ANOVA has not revealed significant differences between the two juices studied, and according to the results,we can classify both juices among the food acids, which gives the ability to keep for long time without undergoing high level heat treatments **(JORA, 1998)**.

A negative correlation between pH and acidity (-0, 57) was detected, so we can affirm that a highpHgives low acidity and vice versa.

2-3- Brix:

The degree Brix translated the rate of dry matter soluble, contained in a solution.

The results of degree Brix are illustrated in Figure N°22:

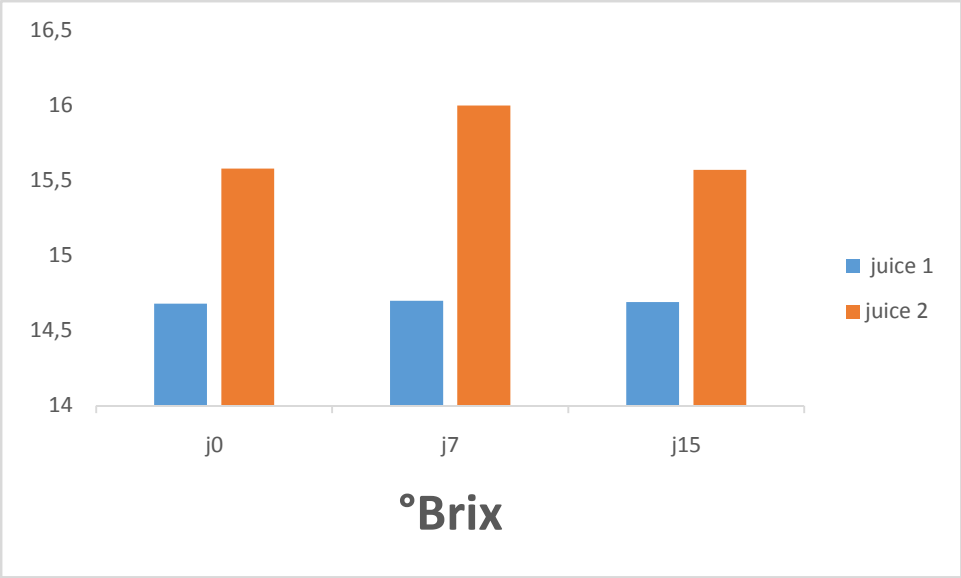

Figure N°22: evolution of degree Brix of the two juices.

According to the results shown on the graph, we do not register any notable variation over time for the values of the two juices.

According to the figure, the degree Brix for the pure grape juice ishowever inferiorthan the value of the grape juice based on a concentrate,what could be explained mainly by the presence of sucrose in large quantities in the grape juice based on a concentrate.

The ANOVA revealed ahighly significant difference (P=0,001932). The values found for the two juices are compliant to the norms which are (>13, 6°B and > 16°B) respectively for grape juice pure and grape juice based on a concentrate**(Anonymous, 1978)**

2-4 -The reducing sugars:

The reducing sugars are simple sugars as glucose, fructose, arabinose, which are generally largely abundant in fresh fruits as grapes**(DELANOE and *al*, 1987)**. The report G/ F evolve from 5 and 2 to 1 during the fruit set, ripening, and maturation **(INAKI et *al*, 2005)**. These sugars have a beneficial contribution to consumer health compared to other artificial sugars(industrial compound).

The results of reducing sugars are illustrated in Figure N°23:

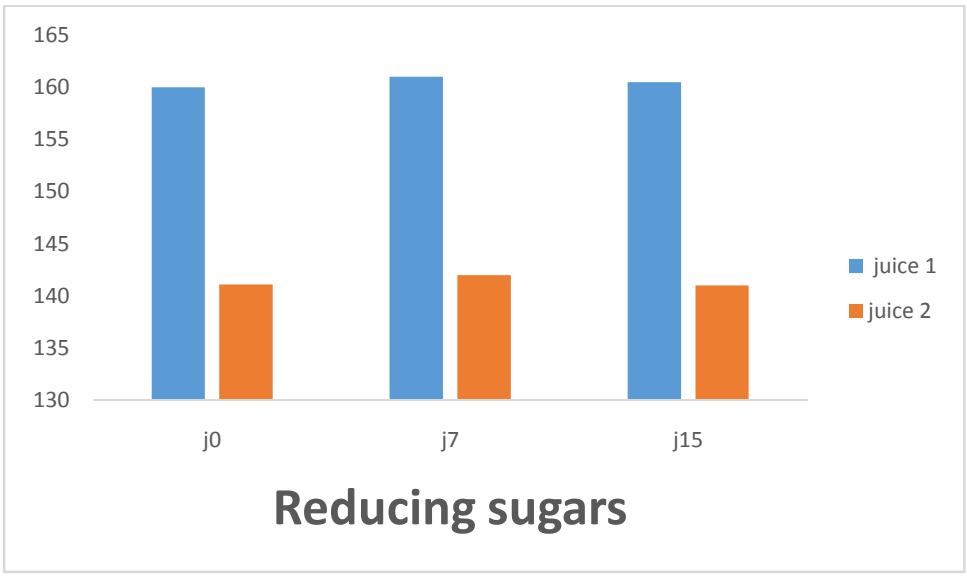

Figure N°23: evolution of reducing sugars of the two juices

According to this figure, we do not remark any variations in the values for both juices over time. The rate of reducing sugars for grape juice pure is twice higher compared to the grape juice based on a concentrate. In fact it is recorded a value of 160 g/ l for the first and 140g/ l for the second and this difference is mainly due to the freshness of the fruits orgrapes, which are rich in this kind of simple sugars unlike the grape juice based on a concentrate prepared at the laboratory.

The analysis of the variance revealed a difference very highly significant with (P=0,000002). The values found are in accordance with the norms **(AFNOR, 1986)** and**(OIV, 2011)** which gives the pure grape juice ability to compete with several products on the market through itsbeneficial contributions for consumer health (sugars, vitamins, mineral salts and phenolic compounds) .

2-5-The viscosity:

The viscosity is a parameter useful for, whether our juice is pulpy or not, it is a simple measure and easy.

The results of viscosity are illustrated in Figure N°24:

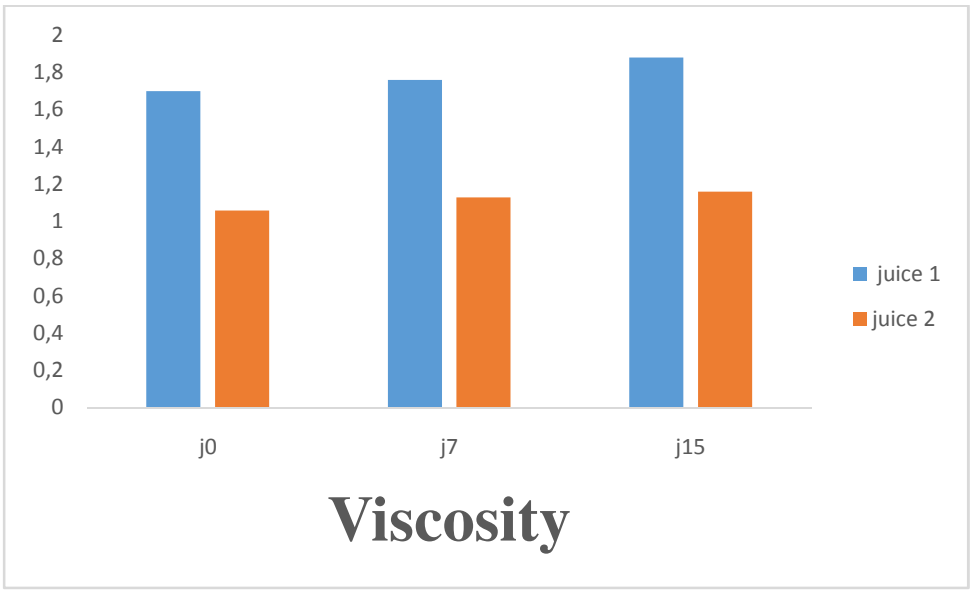

Figure N°24: evolution of viscosity of the two juices

According to the results illustrated by this figure, we recorded a simple change in viscosity for two types of juice, which is due to the duration of the conservation period for the two types of juice. From these results,pure grape juice is more viscous compared to grape juice based on a concentrate and this is mainly due to pulp grape, which makes this juice more viscous.

The ANOVA revealed a highly significant difference with (P=0,000397).

Our results are in accordance with those of the norm **(AFNOR, 1986).** Theseobtained results provide information on the quality of the pure grape juice.

3-Microbiological characteristics of the two juices:

The results of the microbiological analysis for both juices from the first day of manufacturing are summarized in the table N°12:

The microbiological standards of fruit juice published in the Official journal of the Algerian Republic N° of 27/ 05/ 1998, are given in Annex(3).

Germ sought	Juice pure	juice based on a concentrate
Yeast	Abs	Abs
Mold	Abs	Abs
Total coliforms	Abs	Abs
Total germs	Abs	Abs

According to the resultsobtained of the microbiological analysis for both juices, we observed a total absence of germs indicators of contamination, which explains the masteryof hygiene during the preparation of the two juices and the effectiveness of the pasteurization used.

According to these results and according to order of 23/ 07/ 1994 the Official journal N°35 on the microbiological specifications of certain food we can conclude that the two juices reveal a satisfactory microbiological quality.

4- Organolepticcharacteristics of the two juices:

The characteristics ofthe two juices from first day of manufacturing are illustrated in the table N°13.

Table N°13: organoleptic characteristics of the two juices to first day of manufacturing.

Parameters	Juice pure	juice basis of a concentrate	method used
Appearance	Viscous	Liquid	visual inspection
Color	characteristics of white grapes	Honey	visual inspection
Odour	characteristics of white grapes	characteristics of white grapes	examination sensory

Results &discussion

We noted that the two juices are different according to color and the aspect, moreover the juice pure is natural, it took the color of white grape and also more viscous thanks to the grape pulp , which explains its assessment by the jury of tasting.

5-Conclusion:

According to the whole results, we can conclude that the pure grape juice is more appreciated by consumers and the same time it has health benefits.

Without preservatives, without additives, without aromas, it is natural and pure unlike the grape juice based on a concentrate where application of all kind of additives is essential, those additives are suspected tocause diseases such as cancer...

Conclusion

Conclusion:

The grape berries haveinteresting nutritional qualities. It is available locally because its plant is well adaptedto our climate and soils groundnotably in some regions of Algeria. However, since the production of this fruit is seasonal as elsewhere, there is a need to try to transform and manufacturejuices, jams, or dry raisins to allow a long duration of conservation. The physicochemical analysesallowed us to characterize themanufactured (grape juice pure) product and verify its compliance to standard ofinternational trade. Without forgetting to make a comparison with a grape juice based on a concentrate and note anydifferences, and assess the quality of the two juices on a commercially viewpointto deduct which juice bringing more profit to consumers.

With regard to sensory analysis, the result is very satisfactory for the pure grape juice compared to the grape juice based on the concentrate; this result is well confirmed by the hedonic test.

The microbiological assays carried out to verify the stability of the product from the first day of manufacture and during storage. In addition, the pH and acidity are playing an important role on the conservation of the product. The critical point, which risksleadingto the alteration duringstorage, is the possible proliferation of acidophilic microorganisms. For this reason,we must keep the product in good conditions (temperature of refrigeration without light).

Finally, according to all analyses results carried, we found that the characteristics as well as physicochemical, microbiological and organoleptic for both juices (pure and based on a concentrate) led us to the fact that pure grape juice is the best product for the parameters studied.

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Annexe

ANNEXE

Date :……

Time :….....

Location :……

hedonic Evaluation

You will the sample. Taste it and check the number corresponding to your printing:

1- Very unpleasant

2- Unpleasant

3- Enough unpleasant

4- Neither unpleasant neither pleasant

5- Enough pleasant

6- Pleasant

7- Very Pleasant

Tank you

ANNEXE

Date: ……..

Place of the investigation: …….

Sample N°:……....

Tasted by: …….

Questionnaire

Test tasting

As part to achieve this survey for the two juice, please answer this questionnaire. How do you find these two juice? You can evaluate them with scale intensity of 0 to 5.

Color

0	1	2	3	4	5

0 : Less pleasant 5 : Very pleasant

Consistansy

0	1	2	3	4	5

0 : mauvaise 5 : Good

odor

0	1	2	3	4	5

0 : Bad 5 : Very good

ANNEXE

Taste

0	1	2	3	4	5

0 : Bad 5 : Very good

Sugar

0	1	2	3	4	5

0 : Less pleasant 5 : Very peasant

Acidity

0	1	2	3	4	5

0 : Less pleasant 5 : Very peasant

Thank you

The microbiological standards

ANNEXE

The microbiological standards of juice fruit published in the Official journal of the Republic Algerian N° of 27/ 05/ 1998 are in the following table:

Microorganisms	n	c	m	M
Coliforms	5	2	abs	abs
Yeast/1L	5	2	<20	<200
Mold/100ml	5	2	10	100
Clostridium sulfito reducing	5	0	abs	abs

n: number of unit component the sample.

Name of the acid	the coefficients
malic acid	0,67

c: number of unit of the sample giving values between (m) and (M)

m: threshold below which the product is considered of satisfactory quality.

M: threshold limit acceptability beyond which the results are never considered satisfactory, without that, the product is considered toxic.

M: 10m at the enumeration made in solid medium.

M:30m at the enumeration made in liquid medium.

Statistics elementary

Calculated the arithmetic average (M):

$$\mathbf{M=1/n\sum_i x_i}$$

Thank you

ANNEXE

oxalic acid	0,45
citric monohydrate acid	0,7
tartaric acid	0,75
sulfuric acid	0,49
acetic acid	0,6
lactic acid	0,9

The coefficients acids according to (Afnor, 1986):

Grinder:

Machine URSHEL of USA it Thames the result using the screen different templates (5 mm to 0, 5 mm) and scrapers that turn to a given speed.

Viticulture in Algeria:

Is around across the country to the West: Tlemcen, SidiBel Abbots and AinTİmouchent are the most important cities producing the vine, in the East: Skikda and Bejaia and the center have the hills of Sahel, Blida, Medea, Mitidja and Kabylie(LERY, 1982).

Résumé

Le raisin est un fruit très nutritif très cultivé en Algérie. Pourtant il n'est pas disponible toute l'année à cause de son caractère saisonnier. C'est pourquoi il parait intéressant de conserver ce fruit sous plusieurs formes (raisin sec, jus de raisin pur, concentré de raisin, nectar de raisin et le vin) pour permettre d'avoir sur le marché la disponibilité des produits dérivés de raisin durant toute l'année.

Notre étude consiste à faire une comparaison entre deux jus de raisin dont l'un est pur et l'autre obtenu à base d'un concentré de raisin blanc. Les deux jus sont soumis aux différentes analyses physicochimiques (pH, acidité, sucres totaux et réducteurs, composés phénoliques…pour savoir parmi quels produits alimentaires on peut classer ces derniers.

En ce qui concerne l'analyse sensorielle, le jus de raisin pur est plus apprécié par les consommateurs et par les jurys de dégustation ce qui donne au jus de raisin pur l'aptitude de conquérir plusieurs produits sur le marché y compris le jus de raisin à base d'un concentré.

En fin, les résultats de l'analyse microbiologique pour les deux jus sont conformes aux normes.

Mots-clés : Jus, raisin, analyse physicochimique, analyse microbiologique, analyse sensorielles.

Abstract:

The grape is a fruit very nutritious grown in Algeria. Yet it is not available all year because of its seasonal nature. Thatis why it seems interesting to keep this fruit in several forms (dry raisin, pure grape juice, concentrated grape juice, nectar and wine) to make grape and its derivatives available throughout the year on the local market.

We have studiedand compared two grape juices one is pure and the other based on a concentrated of grape white.

The two juices were submitted to differentphysicochemicalanalyses. With regard to sensory analysis, pure grape juice is more appreciated by consumers and tasting jury which gives thepure grape juice the ability to compete with several products on the market including grape juice based on a concentrated.

Finally, results of the microbiological analysis for both juices are in accordance with a norm.

Key- words: Juice, physicochemical analysis, microbiological analysis, organoleptic analysis.