Study of the Hygienic Quality, Physico-Chemical and Biochemical of Dried Dates "Degla-Baidha" For Obtaining the Vinegar Through the Application of Industrial Methods

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Abstract

Production dates ranks important in agriculture Algerian part of it remains unreleased (scrap).
To find a more lucrative market, we have proposed the valuation dates of low-value by the utilization of biotechnological products to obtain new business easily and with high added value.
For this purpose, we have tried to make vinegar from date juice, variety "Degla Baidha" by the application of industrial methods (fermentation)
The results have revealed:
-The morphological, physico-chemical, biochemical and microbiological study of dates are acceptable.
-The good evolution of the alcoholic fermentation of juice of dates, due to the good growth of the yeast Saccharomyces cerevisiae in this environment.
-The evolution of acetic fermentation is slow and complex due to the sensitivity of acetic acid bacteria Acetobacter acetic.
-The analysis and the test carried out on tasting the vinegar obtained give very encouraging results.
In the light of this work we found that the use of this biotechnology allows one hand to produce organic vinegar excellent nutritional value and other stimulating recovery from varieties of common dates.

Keywords: Date-Baidha Degla,, extraction, fermentation, juice Dates, Valuation Vinegar.

1 Introduction

The Sahara is 90% of the area of Algeria, more than 2 million km2. The date palm (Phoenix dactylifera.) Is a tree of great ecological and economic importance etsocio in the oasis of the desert (El Hadrami et al., 2005). In consequence, it is the focus of agriculture and provides the main resource of Financial oasis. Indeed, dates accounted for both human an animal providential fruit alimentation. Their success over a long period can be explained by the nutritional qualities of these particular fruits rich in sugars and enMinéraux (Benchelah and Maka, 2008).

Note that, Algeria, with a production of 6,439,670 quintals (Anonymous 2010a) of dates has not to our knowledge no processing technology dates to the exception of pulp "Ghars" from soft dates the same name.

Agricultural and agro-industrial activities generate large amounts of waste that can provide new materials for Many food industries. To this end, their valuations by biotechnological processes represent a solution of choice to the extent that it can produce substances with high added value and finally contributes to industrial and agricultural development of the country (Acouren et al., 2008)

Dates low value can be used as substrates carbonésPar microbial species (yeast, bacteria, ... etc..) To produce biomass. LesLevures are the first micro-organisms have been observed under the microscope by Leeuwenhoek AntoineVan that drew them to 1680. They are a valuable source deproteinized because they are home to a very active protein biosynthesis.
Many substances that we use every day are the result of the exploitation of microorganisms whose origin dates back to the earliest times, but it was not until Pasteur's discoveries to be able to establish the precise science that led to the birth of a fermentation industry outside the traditional framework (bread, fermented beverages ... etc).. (Bacha, 2008)
Our work is in this perspective and focuses on the valuation date of a low value which is Degla-Baidha dry variety trials by obtaining optimization vinegar and comparing it to that made in " SIDNA "national facility for the production of vinegar.

2-MATERIALS AND METHODS

2.1. Plant Equipment

The plant material used is the dry variety Dagla-Baidha. Choice of this variety is justified by its abundance in Algeria, sugar concentration content and facilitates conservation.

Fig1: the "Degla-Baidha" variety (Hannachi et *al.*, 1998)

2.2. Biological Equipment

The biological material used for the production of alcohol is *Saccharomyces cerevisiae*. And for the conversion of alcohol into acetic acid *acètiè Acetobacter* strain is isolated from acetator Frings

3- Experimental Protocol

3.1. juice preparation date:

Once washed dates, pitted and crushed. 2.5 liters of water is added to 1 kg of dates. Heated in a water bath at 85 ° C for 45 minutes and with continuous stirring. The must obtained is filtered through a filter and then sterilized in an autoclave at 120 ° C for 20 minutes.

Fig2 :juice date

Table 1: Characteristics of date juice obtained

Parameter	Value

pH	5,90
IR	1, 365
IB (DO à 420 nm)	0,6
Brix (%)	14,5

2-The fermentation

2.1. Preparation of Wort

To ensure the smooth running of the alcoholic fermentation, the juice of dates undergo some operations shown in Figure 10.

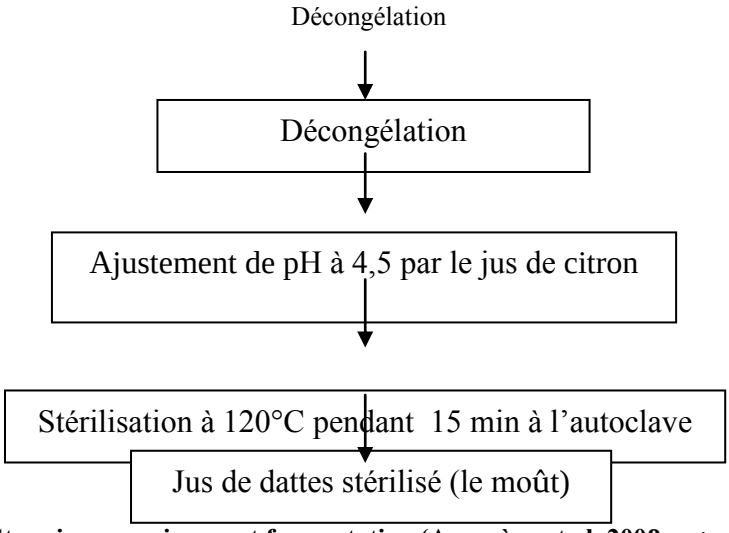

Fig3 :Steps in preparing wort fermentation (Acourène et al, 2008.e *et al.*,2008)

2.2. Implementation of the Alcoholic Fermentation

This operation aims to grow the yeast Saccharomyces cereviciea in date juice and give a greater amount of biomass

The different stages of fermentation are shown in figure11.

-The start of the alcoholic fermentation occurs by the release of CO2.

-The parameters analyzed during this process are:

* The pH. * The ° Brix. * The alcohol content.

The stop-release of CO2 indicates the end of the fermentation cycle.

Using Ebulliometer as rapid method for the measurement of Alcoholic degree:

Definition: Ebulliometer probe electronic-Ref, 160350D: Is a hydrometer used as a simple and rapid method for the determination
the alcohol content of wine. (see fig 6).

- Basic Operation:
- Fill the boiler up to the mark.
- Turn the power on.
- Supply cold water cooling column.
- where the wine comes to a boil, wait until the temperature display is well stabilized.
- stop heating. Tvin Rated this boiling temperature.
- ébulliomèter on the disk, read in front of the boiling temperature Tvin alcohol content of wine.

example:
Tvin = 91.4 ° C, as wine disk = 1

Fig6: Ebulliometer with e-Réf.160350D probe.

2.2.Kinetics of alcoholic fermentation
The following during alcoholic fermentation parameters: pH, brix level, alcohol

2.2. Evolution of pH During the Fermentation (Figure 16)

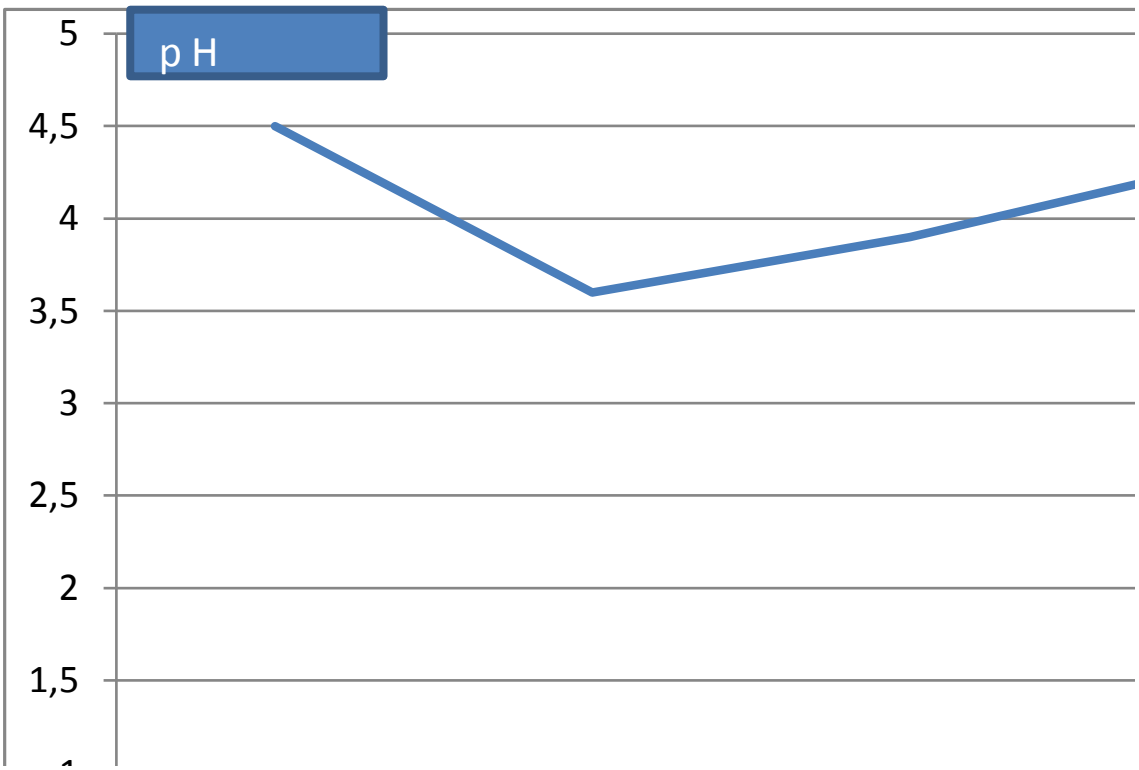

Fig 7: Evolution of pH during the fermentation

According to the curve shows that the pH of the juice decreases or during fermentation to reach a value of 3.6 in 24 hours then a slight increase in pH

According to Akin (2008), who modeled the variation of pH during the fermentation of grape juice, pH decreases hang early in the process as a result of production of acidic compounds (succinic acid, lactic acid, acetic ...) by yeast and mainly due to an increase in the production of ethanol which changes the dissociation constant of the components and especially organic acids.

II-2-2-Evolution of alcohol content during alcoholic fermentation

Follow the evolution of alcohol content is through the use of ebulliometer.

The alcohol level obtained is 8.6 alcohol level after 72heurs and this value indicates the smooth running of the alcoholic fermentation (figure 17).

According Boukhiar, 2009L'alcool is the major compound produced during alcoholic fermentation. Through known literature that alcohol affects the refractive index, density, and thus the dissociation constants of the acid compounds of the solvent.

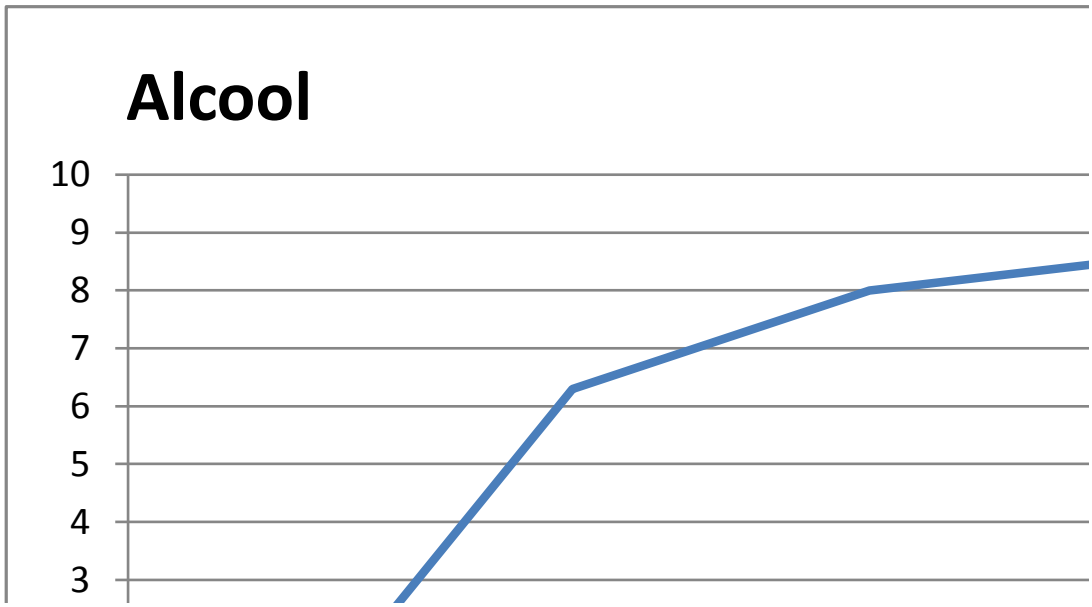

Figure8: Evolution of alcohol during fermentation

2.2.3. Evolution of Brix During Alcoholic Fermentation

We see from Fig (18) that (Rate soluble solid) decreases during the fermentation jusqu'la value of 6 and the decrease can be interpreted by the transformation of sugar into ethanol by yeast *Saccharomyces cereviciae.*

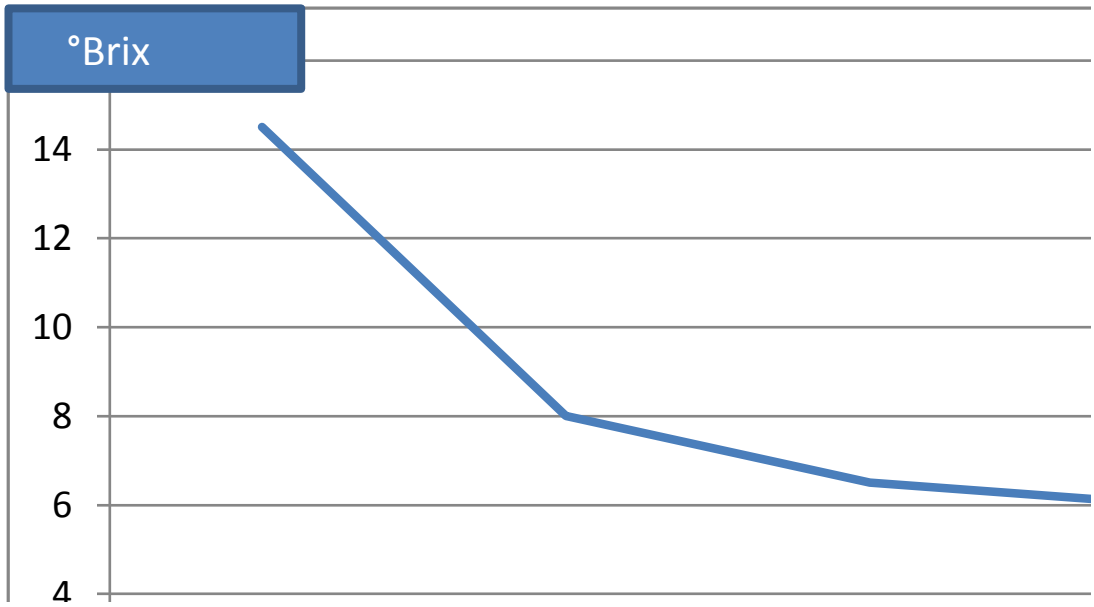

Fig9*: Evolution of brix during alcoholic fermentation*

2.3. Analysis of Fermented Date Juice

The product obtained was characterized by: (pH = 4, 3), (brix = 6), (alcohol content = 8.6)

¶

Fig 10: *date juice fermented (wine dates)*

The 3-acetic fermentation

A-method of manufacturing vinegar at the factory SINPAC

The manufacturing process of vinegar applied in this property is based on the cycle of Fed-batch fermentation for the production of vinegar concentration proposed by (Park et al., 1991).

1. Preparation tank wort:

-The wort is a mixture of alcohol, vinegar, and nutrients (BionylF15).

BionylF15: specific nutrient for lactic acid bacteria in the form of a powder (sugars, mineral salts and yeast extract), it should be dissolved in a small vessel before mixing vinegar with must

. To 1000 l of wort, add about 2.5 kg of nutrient.

The uniform-composition of wort: 1.2-1.5% acid and 11.3% alcohol.

2. The Acétator Frings = the fermenter (see Figure 13)

-The tank of Acétator a total capacity of about 16000l, during fermentation, it is filled with liquid 12000l.

-Always follow the two essential parameters (acidity and alcohol) to monitor the evolution of acetic fermentation.

-When, during the fermentation, the residual alcohol content reached 0.3-0.4 must extract and vinegar 5600L 5600L automatically load mout, so Acétator still contains vinegar, called "mother vinegar "for the survival of acetic acid bacteria. The refrigeration-is by means of a coolant, wherein the cooling water flows, the aeration is performed by turning immediately above the bottom of the aeration tank, the two operations are controlled automatically.

3. Drain tank 4.Unité of 5.Cuve filtration storage filtered vinegar

6. Dilution tank for setting the level of marketing:. Vinegar withdrawn at an acidity of 8.5% Next legislation vinegar sold in bottles containing an acidity of 5%, so there is a process of dilution with drinking water.

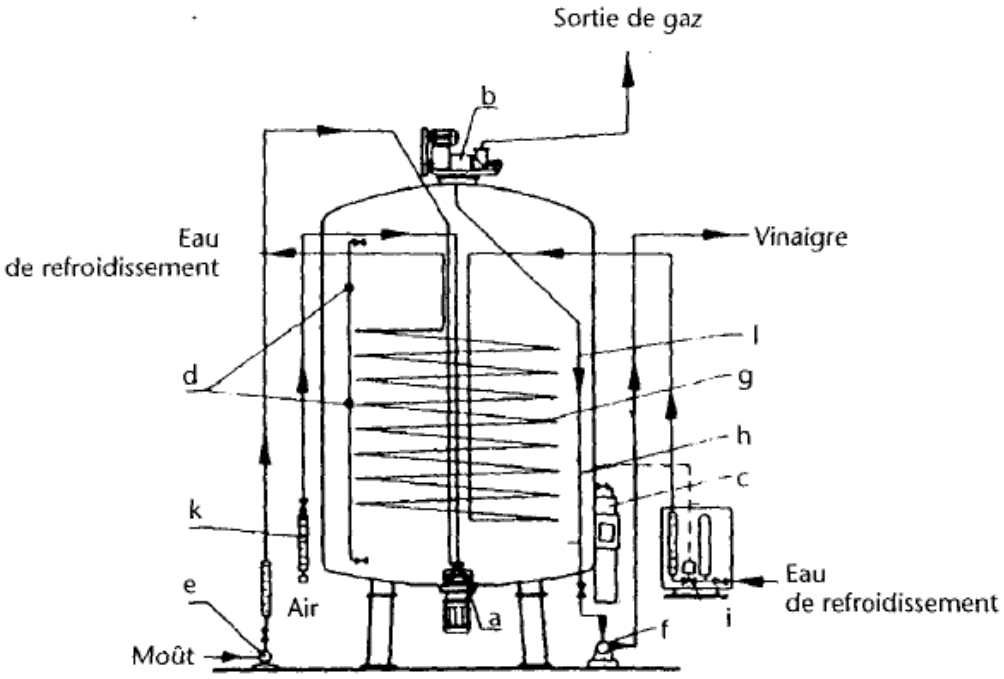

Fig 11: Acétator of frings (Bourgeois and Larpent, 1996)

B-**The realization of the acetic fermentation of wine dates according to industrial methods**

The production of large quantities of vinegar requires continuous addition of date wine vinegar in a mode of aerobic fermentation. Ainsi1, 2 liters of alcohol dates we add two quarts of vinegar in a certification every 36 hours, a quantity of vinegar is withdrawn either 500ml or 1 liter and add the same amount of alcohol dates. (Boughnou 1988).

1. Preparation must: the must of our work is the fermented juice of dates with an alcohol content of 8.6% and 1.5% acidity. First, the juice should be thawed and clarified, then added a small amount of nutrient Bionyl F15 (2.5 g / 1l wort).

2. The implementation of the acetic fermentation

-It takes 250ml of wort in a beaker and 250 ml of vinegar mother recovered from the Acétator Frings at the time close to the end of the fermentation cycle, where the bacterial population is more dense, with about 8.5% acidity of less than 0.5% and the alcohol content.

-After stirring thoroughly, the mixture is divided into three erlennmeyrs.

The erlennmeyrs they let in a marine bath aerobically at a temperature of 30 ° C for 7 days, during which each time we checked the two essential parameters (acidity and alcohol content), knowing that at the beginning of the fermentation acetic acid the mixture of 4.3% acidity and 3.6% alcohol content.

4-Sensory analyzes

It is a hedonic evaluation performed according to the protocol described in the Standards (AFNOR, 1975)

The sample is presented to the tasters (n = 10) so modanique (one sample) and the subject must express its opinion on the flavor (nice) on a rating scale to 6 points

6. Very nice
5. rather nice
4. Neither pleasant nor unpleasant
3. Uncongenial
2. Rather unpleasant
1. Disagreeable

3. Results and interpretation of acetic fermentation

After 7 days of acetic fermentation yields a finished product characterized by three main parameters (alcohol content = 1.2. Brix = 4.5%. And acidity = 5.3%), see Figure

Fig 12: finished product obtained

As explained, it starts with a wort fermentation characterized by (alcoholic = 3.6 degree and acidity = 4.3), despite the acetic fermentation was lasted 7 days, but we have not reached the acetify wort fermentation mainly alcohol

Accordance with approved standards (alcohol does not exceed 0.5% (JORA, 1998), the major drawback lies in the acetic acid bacteria, it is true that after 7 days the acidity reaches 5, 5% indicates the conversion acetic acid in alcohol, but the decrease of alcohol 1,2 alcoholic degree not only due to the transformation of the alcohol into acetic acid

but also about the possible breakdown of alcohol during acetic fermentation because it is an aerobic fermentation thus reduces the yield of acetic acid.

Indeed, the difficulty of mastering this bioconversion, ethanol acid

acetic acid, may explain this result, the industry vinegar uses stem not from pure cultures in industrial conditions, the selection pressure is high and the emergence of low-performing variants is limited since the fermentations were be conducted hang several years without loss of activity and performance. (Bourgeois and Larpent, 1996).

Product comparison from the industrial vinegar SINPAC

This comparison is made on the following indices: alcohol, brix content and acidity.

Fig13: Industrial vinegar and vinegar obtained

Table 2: Comparison of vinegar

Vinaigre industrielle	**Vinaigre obtenue**
Le degré brix :5%	**4,5%**
Teneur d'alcool : 0,3°GL	**1,2°GL**
L'acidité : 8,5%	**5 ,3%**

III-Sensory analysis (AFNOR, 1975)
Analyses of sensory organs comparing two products are shown in the table below.
sample

Attribute A
Industrial vinegar B
Vinegar-based date
Transparent yellow color turns brown
Very hot pungent odor
Rather nice pleasant flavor
Rather acid acid acid
The results obtained for the product (vinegar base date) for flavor are as follows:
6. Very pleasant 1dégustateur
5. rather pleasant: 5 tasters
4. Neither pleasant nor unpleasant: 3 tasters
3. Unpleasant: 1
2. Rather unpleasant: 0
1. Unpleasant: 0
Table XIII: Comparison of the two samples (sensory analysis)

I-Sensory analysis (AFNOR, 1975)

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The results obtained for the product (vinegar base date) for flavor are as follows:

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4. Neither pleasant nor unpleasant: 3 tasters

3. Unpleasant: 1

2. Rather unpleasant: 0

1. Unpleasant: 0

Table XIII: Comparison of the two samples (sensory analysis)

Les résultats obtenus pour le produit (vinaigre à base de datte) pour la saveur sont comme suit :

6. Très agréable : 1dégustateur
5. plutôt agréable : 5 dégustateurs
4. Ni agréable, ni désagréable : 3 dégustateurs
3. Peu agréable : 1
2. Plutôt désagréable :0
1. Désagréable : 0

Tableau XIII : comparaison des les deux échantillons (Analyses sensorielles)

Les résultats sont représentés sous forme d'histogramme statistique (figure 14).

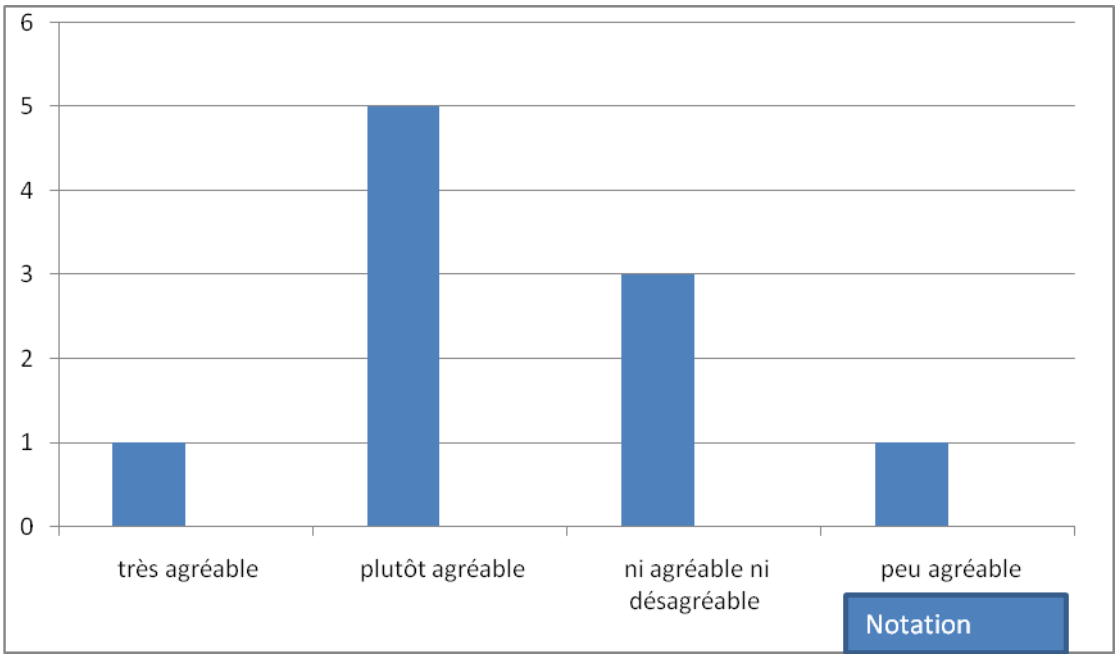

Fig 14: graphic histogram sensory analysis (flavor)

From the results we can say that the value 5 (rather nice) of the rating scale is the value that represents the

Echantillon / Attribut	A Vinaigre industriel	B Vinaigre à base de datte
Couleur	transparent	Jaune vire au brun
Odeur	Très piquant	piquant
Saveur	agréable	Plutôt agréable
Acidité	Plutôt acide	Acide

acceptable score and indicates that our product to an acceptable value according to the rating scale.

Conclusion

Using dates of low market value as a substrate for their development by biotechnological routes currently interested in research in order to obtain consumable products with high added value. For this reason, we try to produce vinegar from date juice, variety "Degla-Baidha" and the determination of some of its features.

The most interesting at the end results of this work are:

-The physical analysis of the date "Degla-Baidha" shows that it is very acceptable physical characteristics (with a weight of 6.29 g where the pulp is more than 80%, a length of 3.65 cm and a width of 1.70 cm).

-The physico-chemical analysis shows the consistency of the dry variety (14.53% moisture) to facilitate its conservation.

-From a microbiological point, this variety has a very good microbiological quality, so a treatment specific storage is not necessary.

-The biochemical analysis showed its high fermentable sugars (reducing sugars 46%), these sugars are used as organic substrate for the production of biomass. The juice of dates obtained with 14.5 ° brix is a favorable environment for the conduct of the alcoholic fermentation.

-The fermentation carried out on the date juice gives a good yield of alcohol (8.6 ° GL), which shows good growth of yeast Saccharomyces cerevisiae in this environment.

-The results of the acetic fermentation show the conversion of a certain quantity of wine dates to acetic acid, but this operation is slow and complex because of the sensitivity of acetic acid bacteria Acetobacter vis-à-vis the various environmental factors.

-Vinegar obtained (1.2 ° GL alcohol) is not consistent with Algerian law (0.5 ° GL alcohol), but the taste test this is very encouraging results.

In the light of these results, some recommendations are necessary:

-Production of acetic fermentation of the juice fermented dates in the best conditions that need acetic bacteria and follow its evolution and analyze vinegar obtained.

-The study of structural and functional characteristics of acetic acid bacteria in particular the genus Acetobacter acetic.

-Determination of minor compounds of date "Degla Baidha" (vitamins, minerals, amino acids ....).

-The study of the morphological and biochemical characteristics of this core to introduce variety in the valuation process.

-The study of the nutritional value of vinegar dates.

-Evaluation of the economic interest of the development of dry by the production of alcohol, vinegar and dates.

Finally, we hope this study an application on an industrial scale to achieve the production and marketing of legitimate date vinegar, and give the dates of low value high added value.

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