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Controlled artichoke fermentation by microbial inoculation

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ABSTRACT

It is widely recognized that certain lactic acid bacteria fall in the use of food products to extend the life and improve the texture and taste.

Our work aims to establish a controlled and efficient accessing the fermentation and storage of artichoke, to replace the traditional method recognized by its quality products perceptible

Strains of lactic acid bacteria and yeast have shown great power acidifying potential antibacterial and high fermentative have been isolated, purified and preserved, are able to retain and ferment naturally artichoke without adding additives and industrial chemicals.

Deuze among bacterial strains, the lactic acid bacterium SMBL1, lactic acid bacteria and SMBL1 yeast strain SMLV1 were kept to constitute the ferment of fermentation.

Artichoke fermentation was carried out at two experimental protocols as follows: a spontaneous fermentation and a second controlled performed by inoculating a simultaneous mixing of the three strains (SMBL1, and SMBL2 SMLV1).

Analysis of physicochemical parameters (temperature, acidity, pH) and microbiological (FMAT, Fecal coliforms, lactic acid bacteria and yeasts) were achieved during the evolution of two fermentations.

The ensuing results are better in terms of fermentation time 30 days, reduction of pH 3.57 and 1.22 acid production, these results are not the same for the traditional fermentation. This controlled fermentation allowed obtaining good quality artichokes homogeneous final proper hygienic quality and long life.

KEYWORDS

Artichoke;
Lactic acid bacteria;
Yeast;
Spontaneous fermentation;
Fermentation controlled closed.

INTRODUCTION

Lactic fermentation is a spontaneous process which is possibly the drying or cooling, shows a better conservation practice. It is considered among the most ancient food preservation technologies in the world.

The food from fermented food such as bread, vegetables and olives, were prepared and consumed during long periods and are securely attached to the cultures and habits, especially in villages and rural households.

Fermented foods are loved in the entire world and in some places perform a demonstrative plan participa-

tion of many people[1,2].

Conservation through salt certain foods fruits, vegetables and meat, is a very ancient. Artichokes take a significant place in Morocco.

Economic losses due to the proliferation of molds and bacteria, which is why exports to Europe are weak and microbiological problems on products are often noticed[3].

The artichoke is a suitable medium for the growth of lactic acid bacteria and yeasts, since it contains sugar.

Yeasts generally support large osmotic pressure and pH values are very low[4].

The fermentation process artichoke in Morocco remains classic and results are widely acceptable and slightly changing, so we need to replace it with a controlled process with a culture with three types of microorganisms (lactic acid bacteria SMBL1 two, and yeast SMBL2 SMLV1).

The choice of two lactic acid bacteria and SMBL1 SMBL2 essentially based on the following criteria:

-Preferably homofermentative strain;

-Strain in acidifying power important;

-Strain pronounced antibacterial activity;

-Strain accompanied by intrinsic or production of dietary supplements;

-Accompanied by a production strain intrinsic or extrinsic growth factors.

Lactic acid bacteria are isolated SMBL2 SMBL1 and brine spontaneous fermentation of carrots. The yeast is selected from the spontaneous fermentation brine olives, it tolerates salty environment (brine containing 15% salt), has a large fermentative power. Multiple subcultures were made. The result is the production of three strains pure finely. Their combinations are applied to get the appropriate mix our fermentation.

Only Gram-positive and catalase negative were selected and streaked on medium (De Man Rogosa and Sharp Agar) MRS. The yeast was isolated on medium (potato dextrose agar) PDA. Conservation is at 4 ° C.

The evaluation is done by acidifying to pH and acidity final on semi synthetic fluid containing the strain involved.

Fermentation protocol

Artichokes were well cut with knives on a surface sterilized sterilized under disinfecting and carefully washed after being peeled and then soaked in a 15% brine salt.

The fermentation was carried artichokes in two experimental protocols:

- The artichokes left at room temperature to ferment spontaneously.

- Artichokes are inoculated simultaneously by a ferment consisting of two lactic acid bacteria and yeast.

A concentration of 4 g/L of glucose and 4 g/l of extract of starch are added to the brine in the two cases.

Concentration of 15% salt is selected after a preliminary study.

Sampling and monitoring of fermentation

Samples from the brine artichokes spontaneous fermentation and controlled fermentation are carried out regularly. Physicochemical parameters measured include: pH, temperature and acidity microbiological parameters measured are: FMAT, fecal coliforms and yeasts and lactic acid bacteria.

Enumeration of the FMAT is performed on a medium (Plate Count Agar) PCA, fecal coliforms on medium (Agar Deoxycholate) DCL, lactic acid bacteria on medium (De Man Rogosa and Sharp Agar) and yeasts on MRS medium (Potato Dextrose Agar) PDA

MATERIALS AND METHODS

Spontaneous artichokes fermentation

Mode of processing samples

Sample processing began in the traditional manner. Artichokes are placed in a brine prepared according to the requirements of the rural population of the region of Gharb. It is to put a handful of salt in a liter of water. The brine is poured into a jar filled with pieces of artichoke receptacles and 4 to 5 pieces of lemon. Marinade obtained is subjected to testing analyzes. Monitoring of physico-chemical parameters (pH, acidity and temperature) and microbial (yeast, lactic FMAT, fecal coliforms) has been programmed.

Collection, preparation of plant material and brine

The artichokes were collected from the Gharb region. And particularly from Kenitra, and Sidi Kacem Sidi Slimane. Samples collected are returned to the laboratory for hulling, cutting, preparation and analysis.

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After sorting, all samples are washed artichokes to the water stream, peeled and cut manually with a knife sterilized, then carefully placed in glass jars.

A handful of salt is put into a jar. The water added thereto in an amount of 200 ml for stirring, homogenizing and redissolution. Salt water is brought up to respect the gauge of 1 liter beaker. After the second homogenization, the brine is poured into the receptacles of the artichokes cut in pieces. It should be noted that five pieces of lemon have already been integrated into the jar pre-marinated.

Start of the fermentation and production of sampling

Fermentation is, for us, started from the very first contact with the sample with brine. Periodic samples were performed. The period ended is five days. Aliquots were subjected to physicochemical and microbiological analyzes.

Physicochemical analysis

Temperature measurement

The temperature of the sample is measured using a thermocouple (temperature pH) type Micro pH Crison 2000. The values are read directly on the display of the device.

PH measurement

After calibration, the electrode of the pH meter is soaked in 20ml brine artichoke contained in a 100ml Erlenmeyer flask. The pH value is taken directly from the screen of the same apparatus mentioned above (thermocouple: Crison Micro pH 2000). The standards used are pH 4 and 7

Measure of acidity

About 10 ml of brine contained in a 100ml Erlenmeyer flask are added a few drops of phenolphthalein indicator solution 1%. The titration is carried out with a solution of NaOH (N/9) until the indicator changes color to pink. The titratable acidity is expressed as a percentage of lactic acid (MW = 90.08 g) in 100 ml of brine. It is given by the following formula:

$$\%\ \text{Lactic acid} = \frac{\text{Vol (NaOH)} \times \text{N (NaOH)} \times (90.08) \times (100)}{1000 \times (\text{weight of sample})}$$

Microbiological analysis

Microbiological flora concerned hygienic interest (the FMAT, fecal coliforms) and that of biotechnological interest (lactic acid bacteria and yeasts).

Enumeration of total aerobic mesophilic flora: TAMF

Counting FMAT provides information on the overall bacterial load biotope artichoke marinade. Heavy load is an indicator of the degree of infection or putrefaction of the raw material (artichoke). The TSA is our medium of choice for the enumeration of the FMAT. Culture media were inoculated and incubated at 30 ° C for 48 h.

Sowings are made from dilute solutions of brine. These are prepared by dilution methodology ranging from 10 to 10. And, incorporating 1ml of solution diluted in 9ml of saline. From the chosen dilution, 1 ml was seeded at the bottom of a sterile box, where 20ml of TSA, previously sterilized at 120 ° C for 20 min and cooled to 45-50 ° C, were poured aseptically. Just boxes with the number of colonies is between 30 and 300 are maintained for the enumeration.

Enumeration of fecal coliform

Total coliforms and faecal germs usual digestive tract of humans and / or animals. Their existence in a medium is evidence of the degree of contamination of the sample analyzed and the lack of compliance with hygiene in the middle of harvest. The culture medium we used to accomplish this activity is the DCL (Deoxycholate Lactose Agar).

Seeding is done in depth. Incubation was performed at 37 ° C for total coliforms and 44.5 ° C for fecal coliforms. The reading is carried out after 3 days. Similarly, only the boxes with the number of colonies is between 30 and 300 are used for enumeration.

Flora of biotechnological interest

Enumeration of yeasts

Enumeration of yeasts is performed on PDA (potato dextrose agar). Series of dilutions are made. Seeding is done as before. Incubation was performed at 30 ° C for 48 h. The counting of colonies is limited to boxes whose number is between 30 and 300.

Enumeration of lactic acid bacteria

Enumeration of lactic acid bacteria is performed on MRS (Man Rogosa and Scharp). 1 ml of the dilution chosen is deposited at the bottom of the Petri dish. It is then covered with 20 ml of the medium previously ster-

ilized and cooled to 45 ° C. After homogenization, the cultures were incubated at 30 ° C. The counting is done after 3 days of incubation and just boxes with the number of colonies is between 30 and 300 are used for counting.

Controlled artichokes fermentation

Sampling, preparation and the start of our controlled fermentation, like going cited in spontaneous fermentation, except that here, we will use our close already selected.

The resulting mixture will be tested analysis. Monitoring of physico-chemical parameters (pH, acidity and temperature) and microbial (yeast, lactic FMAT, fecal coliforms) has been programmed.

And to ensure the stability of our product we will follow the variation of the parameters pH and acidity for a minimum period of 6 months

Physico-chemical analysis:

Periodic samples were performed to follow the evolution of physicochemical parameters. The parameters considered are: temperature, pH and acidity.

Effect of temperature

The temperature of the sample is measured using a thermocouple (temperature pH) type Micro pH Crison 2000. The values are read directly on the display of the device.

Effect of pH

After calibration, the electrode of the pH meter is soaked in 20ml brine artichoke contained in a 100ml Erlenmeyer flask. The pH value is taken directly from the screen of the same apparatus mentioned above (thermocouple: Crison Micro pH 2000). The standards used are pH 4 and 7.

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Microbiological analysis

Periodic samples were performed to follow the evolution of physicochemical parameters. The parameters considered are: lactic acid bacteria, yeast, and FMAT total and fecal coliforms.

Enumeration of total aerobic mesophilic flora: TAMF

Counting FMAT provides information on the overall bacterial load biotope artichoke marinade. Heavy load is an indicator of the degree of infection or putrefaction of the raw material (artichoke). The TSA is our medium of choice for the enumeration of the FMAT. Culture media were inoculated and incubated at 30 ° C for 48 h. Sowings are made from dilute solutions of brine. These are prepared by dilution methodology ranging from 10 to 10. And, incorporating 1ml of solution diluted in 9ml of saline. From the chosen dilution, 1 ml was seeded at the bottom of a sterile box, where 20ml of TSA, previously sterilized at 120 ° C for 20 min and cooled to 45-50 ° C, were poured aseptically. Just boxes with the number of colonies is between 30 and 300 are maintained for the enumeration.

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Enumeration of yeasts

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Enumeration of lactic acid bacteria

Enumeration of lactic acid bacteria is performed on MRS (Man Rogosa and Scharp). 1 ml of the dilution chosen is deposited at the bottom of the Petri dish. It is

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then covered with 20 ml of the medium previously sterilized and cooled to 45 ° C. After homogenization, the cultures were incubated at 30 ° C. The counting is done after 3 days of incubation and just boxes with the number of colonies is between 30 and 300 are used for counting.

Study of physico-chemical stability of artichokes mixed culture

We will follow the variation of the parameters pH and acidity for a minimum period of 6 months

RESULTS AND DISCUSSION

Spontaneous artichokes fermentation

Trials of spontaneous fermentation artichokes are conducted in four treatments. Each treatment corresponds to a given salt concentration (5, 10, 15 and 30%). The results are presented in the form of photo 1 and TABLE 1.

On each of the tests, monitoring of physico-chemical parameters (temperature, pH, acidity) and microbiological (FMAT, coliforms, yeasts, lactic acid bacteria) accomplished.

Picture 1 : Artichokes spontaneous fermentation. tests at different salt concentrations

Physico-chemical analysis

Temperature measurement

The evolution of the temperature throughout the fermentation period was followed. Normal proliferation of native flora is directly related to changes in temperature. The recorded values of this parameter during the spontaneous fermentation artichokes, ranged between 18 and 25 ° C. Although the fork obtained may affect the generation time of the indigenous population. It is not the same for its extermination. The temperature range is always favorable to the growth and development of mesophilic.

pH measurement

Same for temperature, pH monitoring is performed. The results are shown in TABLE 1. The latter shows the change in pH over time. He leaves the table for a 5% brine, the pH increased from 6.31 during the fifth day of fermentation to 4.58 for the 35th day. To a concentration of 10%, it was found that the pH increases from 6.22 during the fifth day of fermentation to 4.57 for the 35th day. At a concentration of 15%, we noted the pH value of 6.52 as the 5th day. Value fell thereafter to reach 4.58 the 35th day. The final concentration of 30% tested had a pH of 6.85 during the fifth day of fermentation. Value decreased dramatically to be 4.78 after 35 days of fermentation.

The change in pH is indicative of the proper conduct of the fermentation. The dynamics of microbial populations is pronounced. This implies that the metabolism of sugars contained in artichokes, by microorganisms is not affected. The production of organic acids is unobstructed. The increased concentration has almost no effect on the microbial population. Even with high concentrations (30% salt), the pH increased from 6.85 to 4.78. The bacteria involved in the brine are either tolerant or halophilic high concentrations of salt.

Measure of acidity

The third parameter considered essential in our process of transformation biological acidity. This is the same that runs the other two parameters mentioned above. Values throughout the monitoring campaign are shown in TABLE 1. It emerges that the acidity increases die on the 5th day to reach 0.92% after 35 days of fermentation. The same is raised for all concentrations tested except the highest (30%). The latter gave an acidity of 0.80% on the 35th day of fermentation (TABLE 1).

Reduction of 0.12% of the amount of organic acids produced is probably due to the effect of the said concentration of the acid production. This can make us the allocation of the actual activity of the microbial population by such a concentration of salt.

Microbiological analysis

The TAMF

The artichoke is a complex fruit. It contains complex and interesting nutrients such as minerals, vitamins, sugars and proteins. It is therefore a favorable environ-

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TABLE 1 : Monitoring changes in the parameters: pH, acidity, temperature and changes in FMAT crops grown on TSA at 30 ° C for 48 hours, coliform cultures performed on middle DCL 37 ° C for 48 h, yeast cultures performed on medium PDA at 30 ° C for 48 hours and lactic cultures performed on MRS medium at 30 ° C for 48 hours during the spontaneous fermentation of artichokes. Culture performed at room temperature

Collection time	temperature		5%	10%	15%	30%
5days	25°C	PH	6,31	6,22	6,52	6,85
		Acidity	0,28	0,32	0,20	0,08
		TAMF	3.10^3	3.10^3	2.10^2	2.10^2
		Coliforms	0	0	0	0
		yeast	3.10^4	3.10^3	2.10^3	2.10^2
		lactics	6.10^3	5.10^3	5.10^3	0
10days	18°C	PH	5,76	5,75	5,83	5,86
		Acidity	0,48	0,48	0,44	0,44
		TAMF	3.10^6	3.10^6	2.10^6	3.10^2
		Coliforms	0	0	0	0
		yeast	2.10^5	2.10^4	2.10^3	2.10^2
		lactics	7.10^6	6.10^6	7.10^6	0
15days	19°C	PH	5,54	5,50	5,63	5,72
		Acidity	0,60	0,56	0,52	0,48
		TAMF	3.10^6	3.10^6	3.10^6	2.10^2
		Coliforms	0	0	0	0
		yeast	4.10^5	2.10^4	2.10^3	2.10^3
		lactics	7.10^6	5.10^6	6.10^6	0
20days	19°C	PH	5,46	5,58	5,66	5,71
		Acidity	0,60	0,54	0,52	0,48
		TAMF	3.10^7	3.10^7	2.10^5	2.10^3
		Coliforms	0	0	0	0
		yeast	3.10^7	2.10^7	2.10^7	2.10^4
		lactics	7.10^6	5.10^6	6.10^6	0
25days	20°C	PH	5,24	5,33	5,32	5,45
		Acidity	0,68	0,64	0,64	0,60
		TAMF	2.10^6	2.10^5	2.10^5	2.10^2
		Coliforms	0	0	0	0
		yeast	3.10^6	4.10^6	3.10^6	2.10^3
		lactics	6.10^5	4.10^5	5.10^5	0
30days	19°C	PH	4,55	4,57	4,57	4,78
		Acidity	0,92	0,92	0,92	0,80
		TAMF	9.10^4	8.10^4	2.10^4	1.10^2
		Coliforms	0	0	0	0
		yeast	4.10^5	3.10^5	3.10^5	2.10^3
		lactics	2.10^4	4.10^4	2.10^4	0
35days	24°C	PH	4,58	4,57	4,58	4,78
		Acidity	0,92	0,92	0,92	0,80
		TAMF	8.10^3	4.10^2	2.10^2	3.10^1
		Coliforms	0	0	0	0
		yeast	4.10^3	3.10^3	4.10^3	3.10^2
		lactics	5.10^3	4.10^3	5.10^3	0

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ment for the development and growth of microorganisms. We tried to verify this data on brine artichokes. Artichokes fermented in brine 5% salt have been microbiological analyzes. The results showed an increasing trend of FMAT during the first ten days of transformation. The abundance of FMAT spent 3103 cfu / ml on the 5th day of fermentation with a population of 3106 cfu / ml on the 10th day of fermentation. However, we have seen a dramatic fall on the 35th day. The microbial abundance during the day was 8103 cfu / ml after 35 days.

Pickled artichokes for 10% of salt, FMAT gave a curve in its growing population especially during the first ten days. The abundance was 3103 cfu / ml during the fifth day. It has increased by 3 log units during the 10th day (3.106 cfu / ml). A rapid decline took place towards the end of the fermentation period. The abundance was 4102 cfu / ml during 35 days of fermentation.

At a concentration of 15% salt, we observed the same evolution cycle in the population of the FMAT. A concentration of 30% salt, we noted a slight increase in FMAT. The population was 2,102 cfu / ml on the 5th day. She rose slowly to 2103 cfu / ml during the 20th day of fermentation, and returns to an abundance of 2102 cfu / ml on the 25th day, and finally reaches 30 cfu / ml on the 35th day of fermentation (TABLE 1).

For all incorporations salts, we found an increase of the population difficult to FMAT. She was at its lowest at the 35th day of fermentation. The decrease in growth rate is probably due to secondary metabolites characters inhibitory action of salt or the combined action of two factors.

Fecal coliforms

The evolution of the growth of coliforms function of time is shown in TABLE 1. We noted through the analyzes and results obtained the total absence of fecal coliforms.

A report that the absence of coliforms brine is probably due to the absence of the origin of this type of microorganisms in artichokes, stress caused by the osmotic pressure of the salt, low pH result of metabolism and the antibacterial effect induced by lactic acid bacteria.

Lactic acid bacteria and yeasts

The results recorded in TABLE 1 show that the concentration of 5% salt, lactic acid bacteria are represented with a population of 6103 cfu / ml on the 5th day of fermentation. The abundance increases after reaching the population of 7106 cfu / ml on the 10th day of fermentation.

Regarding yeast, it is noteworthy that the dominance of yeast was observed at the 25th day of fermentation. The abundance of the population reached 3107 cfu / ml for yeasts against 6106 cfu / ml for lactic acid bacteria.

The results indicate that in the case of a 10% brine, lactic bacteria appear on the 5th day of fermentation with a rate of 5103 cfu / ml and a rate of 4103 cfu / ml after 35 days.

At 15%, lactic acid bacteria are present in the brine artichoke with an abundance of 5.10^3 cfu / ml at the 5th day of fermentation. She has hardly changed even at the 35th day of fermentation. The abundance of 5103 cfu / ml.

A 30% salt, we noticed a total absence of lactic acid bacteria along the fermentation period. Yeasts begin to appear on the 10th day of de fermentation with a population of 2 102 cfu / ml. She rose to 2104 cfu / ml on the 20th day thereafter descend to 3102 cfu / ml on the 35th day of fermentation.

Controlled artichokes fermentation

Controlled fermentation trials artichokes are conducted in a single treatment. Which corresponds to a given concentration of salt (15%). The results are presented in TABLE 2 On each of the tests, monitoring of physico-chemical parameters (temperature, pH, acidity) and microbiological (FMAT, coliforms, yeasts, lactic acid bacteria) accomplished.

Physicochemical analysis

We followed up on physicochemical parameters such as temperature, pH and acidity. Controlled fermentation is conducted in three buckets filled with artichokes because of one kg each. The results of each test are shown in TABLE 2

Temperature measurement

The evolution of the temperature throughout the fermentation was followed. The proliferation of normal autochthonous flora is directly related to temperature variations. The recorded values †of this parameter during the spontaneous fermentation artichokes, swung between 18 and 24 ° C. Although the resulting change

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can affect the playback time of the indigenous population. It is not the same for her disappearance. The temperature range is always favorable to the growth and development of mesophilic.

PH measurement

PH monitoring is performed to control the transformation process controlled. The results are shown in TABLE 2. The latter shows the change in pH over time. We recorded the pH value of 5.22 as the 5th day. Value fell thereafter to reach 3.64 by the 25th day. The value has dropped dramatically to identify to 3.57 after 30 days of fermentation. The pH change is good informer conduct of controlled fermentation.

Measure of acidity

The third element considered essential in our process of transformation biological acidity. The latter is the same as the other two through the aforementioned parameters. Values throughout the monitoring campaign are shown in TABLE 2. It emerges that the acidity increases die on the 5th day of 0.68% to 1.22% after 30 days of fermentation.

The increase in acidity is an indicator of positive transformation. Holding the acidity at high levels even after 30 days of fermentation involves the growth of lactic outweighs other microorganisms. Pathogens in urban high acidity will find no place. Such acidity is an indication of guaranteed hygienic conditions.

Analysis microbiological

The TAMF

The results reported in TABLE 2 show the growth of the FMAT during the first ten days of transformation. The abundance of FMAT spent 2103 cfu / ml on the 5th day of fermentation with a population of 8106 cfu / ml on the 10th day of fermentation. However, we have seen a dramatic decline in the abundance of the FMAT to the 35th day. The microbial abundance during the day was 2102 cfu / ml.

The decrease in the growth rate of individuals rep-

TABLE 2 : Monitoring changes in the parameters: pH, acidity, temperature and changes in FMAT crops grown on TSA at 30 ° C for 48 h, cultures performed on medium DCL coliforms at 37 ° C for 48 h, yeast cultures performed on medium PDA at 30 ° C for 48 hours and lactic cultures performed on MRS medium at 30 ° C for 48 hours during the controlled fermentation of artichokes pails 1kg. Performed at room temperature, and has a salt concentration equal to 15%

Collection times	temperature		15%	Collection times	temperature		15%
5days	20°C	PH	5,24	20days	22°C	Coliforms	0
		Acidity	0,68			yeast	2.10^7
		TAMF	2.10^3			lactics	0
		Coliforms	0			PH	3,64
		yeast	4.10^3			Acidity	1,18
		lactics	5.10^4	25days	22°C	TAMF	2.10^5
10days	21°C	PH	5,14			Coliforms	0
		Acidity	0,72			yeast	3.10^6
		TAMF	8.10^6			lactics	0
		Coliforms	0			PH	3,57
		yeast	2.10^3			Acidity	1,22
		lactics	7.10^7	30days	24°C	TAMF	2.10^4
15days	24°C	PH	4,63			Coliforms	0
		Acidity	0,88			yeast	3.10^5
		TAMF	3.10^6			lactics	0
		Coliforms	0			PH	3,57
		yeast	2.10^4			Acidity	1,22
		lactics	6.10^5	35days	22°C	TAMF	2.10^2
20days	22°C	PH	3,98			Coliforms	0
		Acidity	1,08			yeast	4.10^3
		TAMF	2.10^6			lactics	0

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resenting the FMAT is quite normal. Factors are probably responsible for the pH, acidity or the inhibitory action exerted by substances of secondary metabolism.

Fecal coliform

The evolution of increased fecal coliforms over time is depicted in TABLE 2. We recorded over the analyzes performed and the results obtained from the total absence of fecal coliforms.

For information, the absence of coliforms in the brine is possibly due to their absence at the origin of artichokes, stress caused by the osmotic pressure of the salt, low pH result of metabolism and antibacterial effect induced by lactic acid bacteria.

Lactic acid bacteria and yeasts

The results listed in TABLE 2 show that lactic acid bacteria are represented with a population of 5104 cfu / ml on the 5th day of fermentation. The abundance increases after reaching the population of 7107 cfu / ml on the 10th day of fermentation.

Regarding yeast, it is noteworthy that the dominance of yeast was observed at the 20th day of fermentation. The abundance of the population reached 2107 cfu / ml for yeasts against a total absence of lactic acid bacteria. The extermination of the latter is due to the hostile conditions on) the depletion of the environment. The finding can not be attributed to pH because pH 3.98 is suitable for the growth of lactic acid bacteria.

Study of physico-chemical stability of artichokes mixed culture

After mastering the optimal growth conditions of our ferment, we considered the creation of a mixed culture test says. This is to gather all the settings preferred by the ferment in the same medium. We launched the start of fermentation monitoring key parameters. Monitoring results are shown in TABLE 3. He emerges as the pH decreases rapidly to its minimum value of 3.57 after 1 month of fermentation. This value is then kept stable even after 6 months of stabilization. The same is met with acidity. Value of 1.22% is obtained dice the first month to remain stable until the sixth month of stabilization.

Stabilization of key parameters of the fermentation are indicators of the stabilization of the conservation of the material used for these purposes. We include artichokes.

TABLE 3 : Study of the physicochemical stability artichokes function of time

Temperature	Times	pH	acidity
24°C	T_0	5,24	0,68
24°C	1 month	3,57	1,22
25°C	3 months	3,56	1,23
24°C	6 months	3,57	1,22

CONCLUSION

The pH and acidity of the brine vary depending on the time and the percentage of salt in the brine. PH between 4.58 and 4.78 and between 0.92 and 0.80 acidity.

FMAT: The total aerobic mesophilic flora generally decreases over time and depending on the salinity. This drop can be explained by the effect of pH recorded, as most Gram-negative bacteria are sensitive to pH and acidity. Similarly, the salt used in brining inhibits most undesirable microorganisms. Also mention that lactic acid bacteria also exert an inhibitory action via lactic acid and bacteriocins synthesized developed[7]. But this can not be pronounced for lower percentages of salt 10.

The coliform removal reflects a natural improvement of the hygienic quality of fermented products.

Brine artichoke spontaneous fermentation is a favorable environment for the growth of yeasts and lactic flora. At certain levels of salt concentration, lactic acid bacteria are replaced by the yeast. The presence of yeast in high salinities highlights the degree of resistance of yeast to salt compared to lactic acid bacteria. The presence of yeast is registered only in 30% brine salt. In addition, it was noted at high salt concentrations, only yeasts that have pushed[8].

Species of lactic acid bacteria and yeasts in the order of succession acidotolérance and adaptation to salinity conditions.

Salt tolerance of lactic acid bacteria gives them an advantage over other less tolerant species and allows them to begin metabolism which allows the production of lactic acid homofermentative strains for majority and therefore inhibits the growth of undesirable microorganisms[6].

The dynamics of the two populations is not always in favor of the positive progress of fermentation. Careful selection of a suitable close could replace the tradi-

tional method known.

Lactic acid bacteria play an essential role in the preservation of food. Previous work has shown that the presence of a representative or more yeasts, lactic acid bacteria is essential for the realization of fermentation[5].

We note that with the use of close selected, the pH of the mash fermentation reached 3.57 and 1.22% acidity. And from the 30th day of fermentation. The pH obtained is consistent for the packaging of food products since according to[9]. The latter requires that the pH of the solution should not cover more than 4.5.

PH and acidity remain stable even after 6 months of stabilization. For food, the two parameters with the corresponding values obtained in our experiments show a good hygienic quality. Bacterial growth is inhibited under these conditions and that the spores can not germinate when the pH is below 4. This result confirms the choice of strains that can therefore replace the traditional method.

Many authors have shown that with an increase in the acidity of the medium, the pH decreases. Microorganisms when they are trying to maintain the internal pH stable and higher than the external environment. Homeostatic mechanisms prevent protons across the cell membrane and enter the cytoplasm, as they expel protons penetrate effectively into the cell.

The attempt to repair the malfunction of pH homeostasis requires energy and the growth rate decreases. In addition, the demand for energy increases, so that nothing left for other cellular functions. If homeostasis can no longer occur, the pH of the cell cytoplasm fall and die. The ability of microorganisms to grow at low pH depends on their ability to prevent the protons enter the cytoplasm. The pH optimum for the development of many bacteria is between 6.5 to 7.5[10].

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