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Research Article

MONITORING THE MATURITY OF AHMEUR BOUAMER AUTOCHTONOUS VARIETY AND DETERMINING OF THE OPTIMUM HARVEST DATE

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ABSTRACT

Morphological ampelography characteristics, technological, phenolic and tannic maturities were studied over four seasons (from 2009 to 2012) of Ahmeur Bouamer autochtonous Algerian variety. During the four harvests, Ahmeur Bouamer's cluster has showed a high quality of morphological parameters (weight, size, number of seeds/ berries per cluster).The weight was proportional to the size of the cluster which was moderately compact, thus avoiding the deformation and the bursting of the berries. As For the maturity index (MI), Ahmeur Bouamer grape recorded values ranging from 31.07 to 54.95 for the four seasons; values which would make it possible to consider that the harvest would be of excellent quality (when 30 <MI <50). As well as for total anthocyanin potential (TAP) exceeding 1000 mg / L and total polyphenol index (TPI) with values greater than 50, these values confirm that the cluster presents high level of maturity. The monitoring of the MI every week in the phase of ripening (september-october) for 2010 and 2011 have showed that the maximum ripeness index was reached on September 27th with highest level of maturity for both harvests, date that can be considered by the winemaker as optimal date of harvest.

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Keywords: Ahmeur Bouamer; phenolic maturity; harvest; maturity index; harvest date.

1. INTRODUCTION

Ahmeur Bouamer or Ahmar Bou'amer belongs to the species *Vitis Viniféra subsp.* Algerian autochthonous variety known under the synonyms of Argelina, Gordo Royal, Téta Vaca, Flame Tokay and Ragol, growing respectively in Europe, America and North Africa [1, 2]. It is located in Kabylie, Tlemcen, Medea and Mascara. This variety is often taken the name of the place where it is grown, such as Ahmar of Benchicao of Medea, Ahmar of Mechtras of Kabylia and Ahmar of Mascara of Mascara region. The microcrystalline analysis which determine the genetic origin of variety attested that Ahmer Bouamer is an Algerian genotype harboring pink berries having as 20S5 adhesion ranked among the five genotypes identified in the world [3]. The Ahmeur Bouamer variety is one of the threatened species retained for valorization by the National Plan for Agricultural and Rural Development (PNDAR) [4]. The Technical Institute of Fruit Arboriculture and Vine (ITAFV) ensures that this ancestral variety, recognized as a regional product, can be developed by increasing its production first to satisfy the local consumption and to export it[5]. In viticulture, the development of the vine is essentially based on the study of its maturation and maturity during its growth cycle [6]. Maturation characterizes the development phases of the entire berry after the flowering phase, it allows to follow its development morphologically and biochemically during two growth phases separated by a slowdown phase. During maturation, indices such as sugar content (S) and total acidity (TA) stabilize and the maturity index (MI) reached their maximum level [7]. The maturity tracks the different organs of the berry (pulp, skin and seeds) during the growth cycle. This maturity is the one sought by the winemaker allowing him to know the type and the level of maturity (technological and phenolic) reached by the grapes.The maturation parameters such as sugar content (S) and total acidity (AT) and maturity index (MI) estimate technological maturity.The content of phenolic compounds such as polyphenols, anthocyanins and tannins as well as their extractability and their diffusion capacity in the processed product (wine or juice) evaluate phenolic maturity also called aromatic maturity [7, 8, 9]. The technological maturity known land maturity is that which is sought by the winemaker for any

type of grape (table grape or transformed product). This maturity is better correlated with the harvest date through their sensory characteristics, which are good indicators of grape ripening (sugar, total acidity and maturity index). The relationship between the two maturities remains narrow because one influences the other; this has been demonstrated by the fact that sugars (technological maturity indicator) improve the production of grape anthocyanins (phenolic maturity indicator) [10]. The sugars also control the various enzymatic transformations that occur throughout the phenolic stage of the grape [11]. In terms of maturity date, the technological maturity (pulp) is reached when the maximum of accumulation of the sugars is reached with an optimal index of maturity contrary to the phenolic maturity (skin) which is reached when the potential in anthocyanins begins to decline after reaching a plateau, the latter occurs after the technological maturity has been reached. Studies have shown that this lag is estimated at about a week [7]. It is obvious that for the winegrower, the follow-up of the two maturities will allow him to arrive at determining the optimal date of harvest for a product of quality and quantity. Depending on the maturity indicators sought and the state of maturation, numerous analysis protocols are used to estimate maturation. These protocols are published by international organizations such as the French Institute of Vineyard and Wine (IFV) or the International Organization of Vine and Wine (OIV). The ITV method and the Glories (1, 2) methods are the most commonly used to evaluated the maturity parameters [12, 13]. For the grape harvest, the Algerian winemaker relies on its appearance and its qualities gustatory like the shape of the grape, the color and the sweet taste of the berries. Most often, it harvests very early or very late its product thus ignoring the optimal harvest date which will give a quality product. Around the world, the winemaker has realized today that the main objective is no longer to ensure a volume of production but a quality of production to increase its competitiveness and compete in the local and international market. In this context, the winemaker is currently based on reliable and rapidly available information on the measurement and followed the maturity of the grapes. The goal in this work is to follow for the first time the maturity of the Ahmeur Bouamer native variety and to try to determine its optimal date of harvest. To that end, some mesurements tools have been proposed in order to determine the parameters of morphological, technological, phenolic and tannic maturities

during four seasons (2009/2010/2011 and 2012). The influence of temperature and rainfall on the phenolic maturity of the grapes was also monitored and the relationship between the quality of the harvest and these parameters was established. The monitoring of the MI every week in the phase of ripening has led to determinated optimal harvest date.

2. MATERIALS AND METHODS

2.1 Materials

Sampling site: Ameur Bouamer grape was harvested from site located in Benchicao (36 11 59 ″ North, 2° 50 55 East, Lat: 36.1996, Lon: 2.84865, altitude: Min. 973m, Max. 1313m) in Medea hills (80 Km South of Algiers). The sampling area is located near ITAFV experimental farm, a parcel of 1h with homogeneous carcteristics as for strength, clone, rootstock and age.The marking area was carried out according to a standardized method in order to have a sampling as heterogeneous as possible described in OIV methods[14]. Sampling was started at veraison and lasted until technological maturity were realised during the harvest of 2009, 2010, 2011 and 2012. Two standardized sampling methods have been used to obtain representative samples in sufficient quantity for a complete study; by cluster (10 whole clusters) and by berry (three batch of 210 berries)[12]. All the samples were put in a plastic box (sufficient volume to avoid settling of the samples) and were transported in coolers at 4-6 ° C to the laboratory. All chemicals used in this study were of analytical grade and were obtained from Sigma Chemical (Co. USA).

Fig.1. Pictures of sampling site of Ameur Bouamer grape from Benchicao

2.2 Methods

2.2.1 Ampelographic characteristics mesurements

Ampelographic characteristics such as weight, size of cluster and berry, number of berries per cluster, number of seeds per berry were determined over the four years of harvest (2009 to 2012).The measurements of the size and weight were made by respectivly a sliding rule and balance OHAUS (Voyager for large masses and Analytical plus for low masses).

2.2.2 Technological maturity parameters mesurements

On juice of 10 berries recovered from the batch of 210 berries, pH, Brix index (sugar level), total acidity (TA), and maturity index (S / AT ratio) were monitored from mid-July to the end of October. The Brix index was read from the ATAGO Master-alpha automatic refractometer (TOKYO, Japan) on a scale from 0 to 20 Brix. The sugar level S is then obtained by conversion of Brix % to g / L of sugar (1 degree of BRIX = 1 g of sugar per 100 g of water S (g / l)).The total acidity (TA) was determined by volumetric determination of the juice by NaOH (0.1M) in the presence of Bromophenol Blue (4g/L) as an indicator dye as described by Dienes-Nagy et al.[15] and calculated as follow:

$$TA(g/L) = V_{NaOH} \times C \quad \textbf{(1)}$$; C= 1.5 tartric acidity coefficient

In this study only tartaric acid (characteristic of the grape) has been considered because its concentration evolves little during the maturity in contrast to the malic acid which is "burned" by the hot summer. The maturity index IM was calculated by S/TA ratio.

2.2.3 Maturation monitoring parameters mesurements (Glories method)

The parameters indicators of maturation (phenolic and tannic maturity) according to the protocol described by the Glories method [12] were estimated by UV-Visible spectrophotometric measurement. Optical densities (od) at 280 and 520 nm for two solutions pH1 and pH 3.2 were measured on a Perkin-Elmer 25/35/45 LAMBDA UV / Vis Spectrophotometer. The application of this protocol had allowed to determined the phenolic and tannic parameters as follows:

(i)Phenolic maturity which consist to determination of anthocyanins by SO_2 bleaching:

The absorbance at 520 nm of the two solutions (test and control) at pH1 and pH 3.2 treated with HCl (0.1M) is measured. The anthocyanins concentration A1 and A2 at pH1 and pH 3.2 are calculate according to the following formula and expressed in mg per liter:

$A(mg/L) = 875 \times (od_{control} - od_{test})$ **(2),** 875 represents the slope of the calibration line obtained from Malvidin-3-glucoside.

This permit to calculate important concentrations for maturation monitoring as for:

Potential for easily extractable anthocyanins (PEA) given by following formula:

$PEA(mg/L) = A_{pH3.2}$ **=2 A₂ (mg/L)** **(3)**

Total anthocyanins potential (TAP) given by following formula:

$TAP(mg/L) = A_{pH1}$ **=2 A₁ (mg/L)** **(4)** (2 represents the dilution factor)

Percentage of extractable anthocyanins (PEA %) given by the following formula:

$$PEA\% = \frac{A_{pH3,2}}{A_{pH1}} \times 100 \quad \textbf{(5)}$$

Anthocyanin extractability (AE) or cell maturity index calculated by the following formula:

$$AE\% = \left((A_{pH1} - A_{pH3,2}) / A_{pH1}\right) \times 100 \quad \textbf{(6)}$$

(ii)Tannic maturity by determination of polyphenolic richness:The optical density at 280 nm of the solution at pH 3.2 (after dilution to 1/100) is measured thus giving the following maturation parameters:

Total phenolic richness calculated as follows:

$$TPR = 2 \times od_{280} \times 100 \quad \textbf{(7)}$$

Porcentage of seed maturity calculated as follows:

$$SM\% = \left[\frac{(TPR - dskin)}{TPR}\right] \times 100 \quad \textbf{(8)}$$ With dskin $=A_{Ph3.2}$ x 40/1000

3. RESULTS AND DISCUSSION

3.1 Ampelographic characteristics of Ahmeur Bouamer variety

The monitoring of Ahmeur Bouamer's morphological ampelographic characteristics on the 2009 to 2012 harvests has permited to have the informations summarized in Table 1. This fruit has moderately compact clusters, average size exceeding 20cm and sometimes up to 30cm. Its average weight exceeds 400g; it can reach 1000g when the season is well balanced in rain and

temperature. The berries of this fruit have ovoid trunk shapes, pink to dark red color with portions remaining green, they have large caliber in weight and size, exceeding 4g and 1.5cm. This weight is important but remains proportional to the size of the cluster which is moderately compact, thus avoiding the deformation of the berries and consequently their bursting. The number of berries per cluster has exceeded 100 berries, three to sometimes four seeds of brown color with a hint of green, are contained in each berry.

Table 1. Ampelographic caracteristics of Ahmeur Bouamer clusters harvested over the four years (2009 to 2012)

Ampelographic caracteristics *	Harvests date			
	09/2009	09/2010	09/2011	10/2012
cluster weight (g)	750.66±96.59	691.10±35.10	571.40 ±19.74	430.39±87.37
cluster Size (cm)	24.31±1.10	27.86±3.62	21.06±1.60	19.5±1.76
Berry weigh (g)				
Top cluster berry	4.82±1.13	5.04 ± 0.58	4.75±1.51	4.22±0.73
Middle cluster berry	5.04±0.98	5.15 ± 0.14	5.94±1.37	5.99±1.14
Bottom cluster berry	5.35±1.15	4.58 ± 1.34	5.17±1.23	4.61±1.34
Berry Size (cm)				
Top cluster berry	1.76±0.20	1.73 ± 0.5	1.76±0.15	1.66±0.15
Middle cluster berry	1.73±0.23	1.73± 0.11	1.86±0.11	1.76±0.23
Bottom cluster berry	1.73±0.32	1.56±0.15	1.73±0.20	1.66±0.25
Berry number /cluster	181.86±19.35	179.66±35.94	120.66±22.14	107.33±6.42
Seeds number/berry	3.11±0.63	3.66±0.33	3.25±0.5	3.66±0.22
100 berries weight (g)	450.78±22.55	429.33±16.92	418.96±12.05	387.13±14.83

* Values determined on the ten representatives harvested clusters.

3.2 Technological maturity of Ahmeur Bouamer variety

The technological maturity monitoring shown in Table 2, has revealed that the Ahmeur Bouamer variety has pH values ranging from 3.66 to 4.15, values found in agreement with those recorded by table grapes rangin from 3.5 to 4, in particular by colored grapes. Related to the pH values obtained, the amount of tartaric acid present in the grape juice (TA) has varied between 3.45 and 6.45 g /L, a value which generally decreases during the maturity. At the

beginning of maturity, the TA value can reach 8g /L then decreases and stabilizes at about 3g /L, below this value, the TA can give a slightly bitter grape thus releasing the astreingence of the grape seeds. As for Soluble sugars (S) or Brix, Ahmeur Bouamer variety with a Brix value of over 20° was considered as a sweet grape. For the index of maturity (MI), Ahmeur Bouamer has recorded values ranging from 31.07 to 54.95 for the four harvests; Indicative values that growers consider of excellent quality of harvest (MI between 30 and 50) [16]. The maturity index of the four harvests indicates that they have reached the technological maturity; the September 2010 harvest stood out from the others by presenting the highest value in MI.

Table 2. Technological, phenolic and tannic maturity of Ahmeur Bouamer from the four harvests (2009 to 2012)

	Sampling dates			
Technological Maturity *	**09 / 2009**	**09 /2010**	**09/2011**	**10/2012**
pH	4.15±0.01	3.72±0.01	3.68±0.01	3.88±0.01
Density	1.0198±0.01	1.0186±0.01	1.0087±0.01	1.0273±0.01
TA (g tartric Acid /L)	6.45±0.01	3.45±0.01	4.15±0.01	5.85±0.01
S (g/L)	≥200	≥200	≥200	≥200
MI (S/TA)	31.07±1.5	54.95±1.66	48.19 ± 2.75	34.18±3.25
Phenolic Maturity **				
PTA (mg/L) at pH1	1150.15±1.89	1189.60±1.69	1170.07±2.05	1070.07±1.78
PEA (mg/L) at pH3. 2	496.86±1.46	730.89±1.97	586.67±1.90	535.89±1.89
AE%	43.20±1.08	61.44±1.18	50.14±1.87	50.08±1.58
Tannic Maturity **				
SM %	17.58±1.15	51.13±1.66	33.08±1.44	17.78±1.99
TPR at pH3. 2	55.82±1.99	97.38±2.15	69.94±1.82	52 .06±1.76
C% ***	31.49±0 .66	52.50±1.05	47.29±1.25	34.15±1.15

* Values determined on the 10 berries recovered from the lot of 210 berries, ** Values determined on a sample of 200 berries taken from the batch of 210 berries, *** C% = (Mp / RPT) 100: represent a contribution of tannins in the polyphenolic content. All the values are determined in triplicate.

3.3 Phenolic and tannic maturity of Ahmeur Bouamer

The phenolic monitoring results for the four harvests has revealed a very high total anthocyanin potential (PTA), exceeding 1000 mg /L (Table 2). According to Guérin et al., the phenolic quality standard classifies grape varieties with PTA values between 1000 and 1200 mg /L as a very good grape varieties, so Ahmeur Bouamer grape has recorded a very high

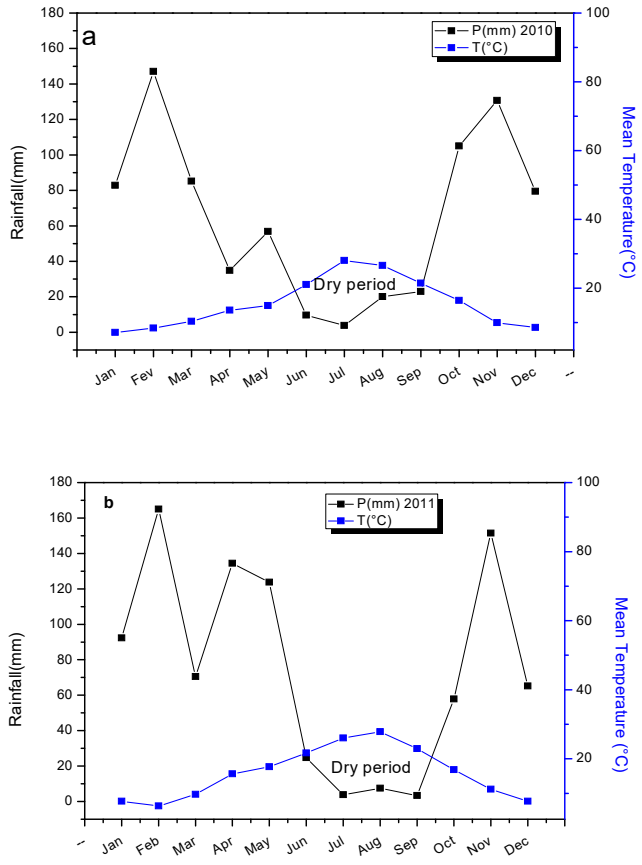
phenolic maturity[17]. As for potential easily extractable anthocyanins (PEA) and anthocyanin extractability (AE %) which are important indicators of phenolic maturity and concern more the transformed products as for grape juice, the both indicators informed on extractible anthocyanins amounts and on the grape ability to release these anthocyanins, more these indicators are high, more the anthocyanins are easily extractible [18]. Ahmeur Bouamer colored variety (pink to deep red) has recorded high amount of PEA range from 500 to 700 mg /L. More than 50% of these concentrations were extractable (EA% value in Table 2) except for the 09/2009 harvest, which concludes that variety was very rich in anthocyanin pigments.The 09/2010 harvest has recorded the highest PEA, PTA and EA% values (730.89±1.97 mg/L, 1189.60±1.69 mg/L and 61.44±1.18% respectively). In general, SM% values are considered moderately good when they are less than 50%, low SM% values reduce the astringent taste in the processed grape product (grape juice**)** [19]. Ahmeur Bouamer grape has recorded acceptable SM% values (Table 2). However, too low SM% values, as in the case of harvests 09/2009 and 10/2012, would prevent the contribution of the tannins in the phenolic content of the grapes, hence the values of C% that did not exceed 35%. Indeed, it is the 09/2010 harvest, which had the highest percentage of maturity while remaining within the limits of acceptable values for table grape varieties with a contribution of more than 50% of tannins in the polyphenolic content, hence the high value of RPT.

3.4 Influence of climatic parameters on the harvest's quality

The relationship between maturity indicators (morphological, technological, phenolic and tannic) that can be influenced by rainfall and temperature has been established[20]. The dry period of the 2010, 2011 and 2012 harvests shown in Figure 2 was compared with the morphological and biochemical changements that takes place between the budburst phase and the beginning of maturity, passing through the flowering, fruiting and veraison phases during a period ranging from 90 to 120 days (Table 3). On a morphological level, the dry period for the 2010 year affected the fruiting phase (June-July) and the beginning of the veraison phase (July-August) for a total duration of 60 days. This latter comes after the flowering phase when the cluster frame has evolved in size and number of flowers that will become berries (clusters size and number of berries exceeding 27 cm and 179 berries, respectively). For the 2011

harvest; the flowering phase was not affected by the dry period which bigins mid-June until mid-September (90 dry period days). The frame cluster has also evolved in size and number of berries (size> 20 cm and number of berries> 120 berry per cluster). The 2012 harvest with a 105 dry period days from May to mid-September, the flowering phase was affected by this dryness justifieted by a fairly average bunch morphology (size <20 cm and number of berries of 107). For the weight of bunches directly related to the growth berries (accumulation of water) which takes place in the end of veraison phase until early maturity (period from late-July to mid-September).The berry was accumulated the water slowly at the end of the veraison phase (end-July), then rapidly at the beginning of maturity (mid-September) until having a constant weight before decreasing in the phase of over-ripening and then loses its firmness. So, for 2010 harvest with a short dry period which has very little influence on veraison and not at all on maturity, important weight clusters have obtained.Three out of ten clusters in the whole clusters sample have exceeded 1000 g (the average cluster weight was around 691.10g). For the 2011 and 2012 harvests, the dry period (90 and 105 days respectively) was affected the water accumulation phase during the end of the veraison and the beginning of maturity, which leads to an average weight of around 500 g. For winegrowers, the stability of the acidity and sugar content was a sign of maximum maturity. The 2010 harvest characterized by the short dry period duration, was recorded significant values of S and AT leading to maturity indices (IM = S / AT) greater than 30 already at the start of the veraison and exceeding 50 just at the start of the maturity phase, value that define an excellent harvest. For the 2011 and 2012 harvests, which were affected by the long dry period duration, these two parameters where found less important but their maturity index remain in the range of good harvest quality values (value between 30 and 50)[20]. On the biochemical balance (Table 3), the values of total anthocyanins were found comparable for the three crops with a slight advance from that of 2010, the dry period has very little influence on this parameter. In reality the pigmentation of the berries is exclusively dependent on the amount of sunshine. In terms of sunshine Algeria, accumulates more than 3000 hours / year which generally gives colorful, sweet and low acid grapes. The evolution of total polyphenols, including those of tannins, was also affected by the dry period; the 2010 harvest has recorded

the highest values in RPT and Mp. A short dry period that does not affect the maturity phase allows the seeds to enrich their composition with polyphenols from the tannins. The maturity phase of the 2011 and 2012 harvests was affected by the excessively long dry period; this has affected the composition of total polyphenols (even those of seed tannins), hence the fairly average values of RPT and Mp. In summary on the three harvests, even if for some the dry period affected certain indicators of maturity, the harvests are qualified as high level of maturity giving grapes of good morphology rich in polyphenols, well colored, sweet and not very acid.



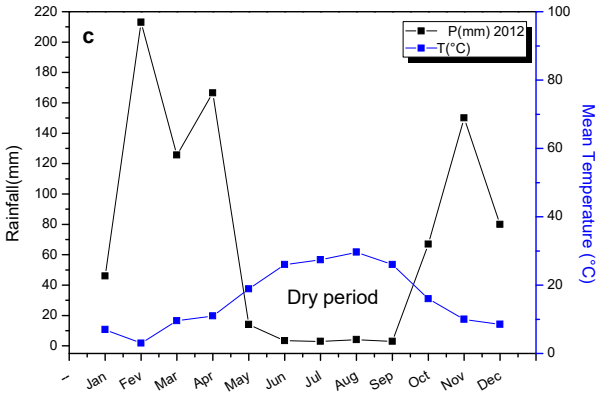


Fig.2. Bagnouls and Gaussen Ombrothérmic diagram of 2010, 2011 and 2012 dry period.

Table 3. Morphologic and Biochemical assessment of Ahmeur Bouamer harvests (2010/2011/2012)

Maturity indicators	Harvests		
	2010	2011	2012
Morphological assessment			
Average size (cm)	27.86±3,62	21.06±1,60	19.5±1,76
Average weight(g)	691.10±35,10	571.40 ±19,74	430.39 ± 87.37
Berry number /cluster	179.66±35.94	120.66±22.14	107.33±6,42
Biochemical assessment			
MI (S/AT)	54.95±1.66	48.19 ± 2.75	34.18±3.25
TPR(IPT)	97.38±2,15	69.94±1,82	52.06±1,76
TAP (mg/l)	1189.60±1.69	1170.07±2.05	1070.07±1.78
SM%	51.13±1.66	33.08±1.44	17.78±1.99
Dry period Duration (days)			
	60	**90**	**105**

3.5 Maturity indicators evolution and determination of optimum harvest day

The biochemical evolution of the Ahmeur Bouamer variety was followed in 2010, from mid-July to the end of October and in 2011 from mid-August to the end of October. Indicators such as pH, tartaric acidity, %Brix and maturity index were determined during this period (Figure 3 on the left). These parameters considered by wine-growers as good indicators for deciding on the quality of harvests thus make it possible to make the decision to harvest. This

monitoring made it possible to locate the phase of maturity, phase which can last up to 45 days, characterized by a beginning, a maximum and an end of maturity during each approximately 15 days where a clear evolution of the indicators of maturity is tangible. For 2010 harvest from mid-July to mid-August characterizing the post-maturity phase (veraison), all these indices were in continuous growth during veraison, their values have increased from 2.64 to 3.24, from 2.59 to 3.11 g / l, from 5.5 to 10.75 and from 21.23 to 30, 91 for pH, AT, % Brix and IM respectively. The veraison phase ends as soon as the maturity index exceeds the value of 30, a value for which the winegrowers consider that the grape variety is in the maturity phase. The beginning of maturity (mid-September) was characterized by a rapid accumulation of sugars (value rising from 10.75 to 15.70 g / L), the pH and tartaric acidity values varied only very little, hence the rapid growth of the maturity index (S / AT) whose value rose from 30.91 to 46.58. For 15 days, these maturity indicators (% Brix and IM) continued to evolve until reaching maximum values (20 and 54.95 respectively), values characterizing the maximum maturity (end of September), the other indicators (pH, AT) have stabilized. The end of maturity was characterized by a stability of the Brix index (value of S stabilized at 20) and by a slight decrease in MI (from 54.95 to 52.89), these parameters will stabilize during the over-ripening phase.The 2011 harvest was followed from the end of the veraison phase recognized by its MI below 30 until over-ripening (Figure 3 on the left), The Ahmeur Bouamer variety was at the beginning of maturity in mid-September when its sugar level by rapid accumulation, has gone from 10.30 to 14.8 and its maturity index has increased from 29.94 to 37.18. Maximum maturity was reached when the variety has registered a value of 20 degrees Brix and 48.19 maturity indexes. After this phase, the end of maturity was reached when the sugar level was stabilized and the maturity index has regressed only very slightly (48.19 to 47.05) by tiny increase in acidity under concentration effect. In the over-ripening phase, the sugar level and the maturity index remained stable for a long time (end-sept to end-oct). The maturity phases of the two harvests 2010 and 2011 are in phase, the maturity stages were reached at the same time with a slight variation in terms of the values of the maturity indicators. The 2010 harvest remains at a high level of maturity compared to that of 2011.

As for harvest date determination, a follow-up of the maturity indexes every 8 days during the months of September-October (month of the maturity phase) was realized as described by many previous studies [9, 19] (Figure 3 (on the right a and b)). An increasing evolution of MI was noted from September 8 to 27 ranging from 40.57 to 54.95 and from 33.40 to 48.19 for the 2010 and 2011 harvests respectively. After September 27 date, the indices have started to decrease on the October 08, reaching the value of 53.1 and 47.19 for the 2010 and 2011 harvests respectively, followed by a stable phase of the indices until 30 October(values stabilized at 52.77 and 47 for 2010 and 2011 respectively). So, the maximum maturity index was reached on September 27; date on which the harvest reached its highest level of maturity.

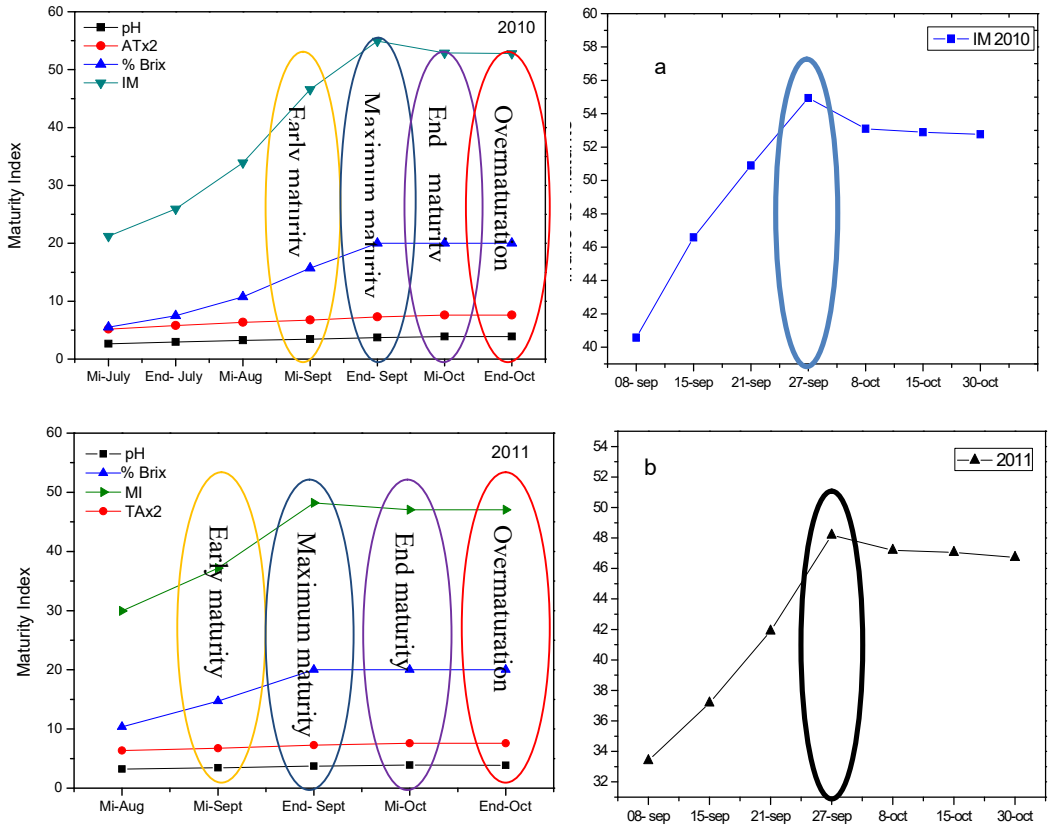


Fig.3. Maturity indicators evolution (figures on the left) and determination of optimum harvest day on 2010 and 2011 harvests (figures a and b on the right)

4. CONCLUSION

For the first time, this study made it possible to collect important data on autochtonous

Ahmeur Bouamer variety during four successive harvest years from 2009 to 2012. The use of Glories methods has permited to calculate several parameters relating to technological, phenolic and tannic maturity. Important maturity index (MI) have been recorded, values exceeding even those that growers consider to give an excellent harvest quality, all harvests have reached the technological maturity. Similarly, for phenolic maturity, Ahmeur Bouamer colored variety has recorded high amount of PEA, PTA, and of EA%, according to Guérin et al., basig on the phenolic quality standard classifies Ahmeur Bouamer as a very good grape variety [17]. As for tannic maturity, Ahmeur Bouamer grape has recorded acceptable SM% and RPT values; giving grapes less astringent with a contribution of more than 50% of tannins in the polyphenolic content. The correlation between dry period and maturity indices (pH, tartaric acidity, %Brix and maturity index) of the three harvests has revealed even if for some the dry period affected certain indicators of maturity, the harvests are qualified as high level of maturity giving grapes of good morphology rich in polyphenols, well colored, sweet and not very acid. The different stages of maturity (veraison, beginning of maturity, maximum maturity, end of maturity and over-ripening) over 4 mounts (July, August, September and October) have been well defined for the 2010 and 2011 harvests. The monitoring of the maturity indexes every 8 days during the months of September-October (month of the maturity phase) made it possible to precisely determine the optimal day of harvest. For ahmeur bouamer with a maximum maturity index reached on September 27; this date with its highest level of maturity is considered a harvest date.

5. ACKNOWLEDGEMENTS

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