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# Technological and Organoleptic Properties of Tomato (*Lycopersicum esculentum*) Produced on Soilless Substrates in Daloa (Haut Sassandra Region, Côte d'Ivoire)

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***Abstract* - The present study was carried out to characterise tomatoes produced on soilless substrates (cocoa, sawdust, cashew and rice husk) and to evaluate their impact on the technological and organoleptic characteristics of the tomato. A tomato crop was grown on these different substrates for three months. The tomato fruits from each substrate were subjected to chemical, technological and sensory analysis. The tomatoes of the different substrates have a high water content (94.83-96.37%). Regarding the technological properties, the results recorded are for saccharin index (1.15%), saccharin coefficient (121.5%) and acidity coefficient (8.29%). The sensory study of the tomatoes reveals that the tasters perceived sensory differences between the tomatoes. Their overall perception of the tomatoes confirms their good acceptability. Also taste, colour, shape and consistency are important criteria of fresh tomatoes. At the end of this study, it was found that the C100 substrate presented the best physicomorphological parameters. Technologically, tomatoes from the RB5050 and B100 substrates can be recommended for industrial processing.**

***Keywords:*** tomato, soilless culture, substrate, technological properties, sensory characteristics.

## I. INTRODUCTION

Traditionally classified as a vegetable, the tomato is also a fleshy fruit in the botanical sense. Intended for fresh consumption or industrial processing, tomato fruit is an important source of minerals, vitamins, antioxidants and fibre in the human diet. Indeed, it contributes to a balanced diet and prevents obesity [1]. It is the most cultivated vegetable in the world, occupying an important place in market gardening in terms of surface area and consumption rate for its great nutritional and organoleptic richness [2] and is considered a dietary food. Indeed, it is low in calories (20 per 100g), but rich in minerals [3]. It represents an important source of health-promoting antioxidants and vitamins (ascorbic acid and α-tocopherol) involved in the detoxification process of cells and help in the prevention of many cancers [3]. Also, these dietary bioactive compounds in tomatoes are reported to reduce the risk of chronic health problems such as cardiovascular diseases, hypertension and both types of diabetes [4]. In Africa, it is grown in all latitudes with an area of about 3 million hectares [5]. Moreover, global tomato production has increased steadily in recent decades. It rose from 48 million tonnes in 1978 to 124 million in 2006 [6]. According to FAO statistics, world tomato production in 2016 was 177,000 million tonnes. In Côte d'Ivoire, production varies between 22,000 and 35,000 tonnes [7]. However, this local production only covers two-thirds of tomato needs, estimated at 100,000 tonnes [8]. The country therefore imports a very large quantity of tomato to meet demand.

Faced with these socio-economic challenges, it is becoming imperative to look for other inputs that can enable sustainable agriculture because imports of agricultural products such as tomatoes are at an all-time high due to low crop yields. To increase yields, farmers resort to mineral fertilisation. However, the use of mineral fertiliser could have a financial impact that tomato growers cannot afford. Not only are these inputs very expensive, but also their misuse can represent a certain risk to human health. Consequently, they compromise the quality of tomato fruits. This explains, in part, the growing consumer interest in organic vegetables and fruits [9]. However, in urban areas, access to cultivable land is particularly difficult, as agriculture competes with urban land uses (housing, infrastructure) [10] Faced with this situation, soilless cultivation represents an important technical mutation allowing the optimisation of agricultural production factors while increasing yields [11]. This farming method is carried out in urban and peri-urban areas on supports other than soil. However, agricultural conditions and farmers' means favour the search for soilless substrates based on local substrates. Work by several authors has shown that agricultural waste products are a potential source of nutrients [12]. Four types of by-products were used in this study (rice husks, cocoa pods, cashew husk, and sawdust). The question is to know what are

 

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the effects of these substrates on the characteristics of tomatoes in Daloa. This work is situated in a context of improving farmers' incomes by reducing input costs on the one hand, and meeting consumer demands for food safety on the other.

The objective of this study is to evaluate the technological and organoleptic properties of tomatoes.

## II. MATERIALS AND METHODS

### 2.1 Study Area

The study was carried out in Côte d'Ivoire in the town of Daloa. The town of Daloa is located in the Haut-Sassandra region in the centre west of Côte d'Ivoire between 6° and 7° north latitude and between 7° and 8° west longitude (Figure 1). It is characterised by four seasons: a long rainy season from April to mid-July, a short dry season from mid-July to mid-September, a short rainy season from mid-September to November and a long dry season from December to March. The average annual rainfall is over 180 mm with temperatures ranging from 24.65 °C to 27.75 °C on average [13]. Thus, this region is one of the major regions of intense tomato production due to the large area of lowland developed for this purpose on the one hand and its high plant richness on the other (Figure 1).

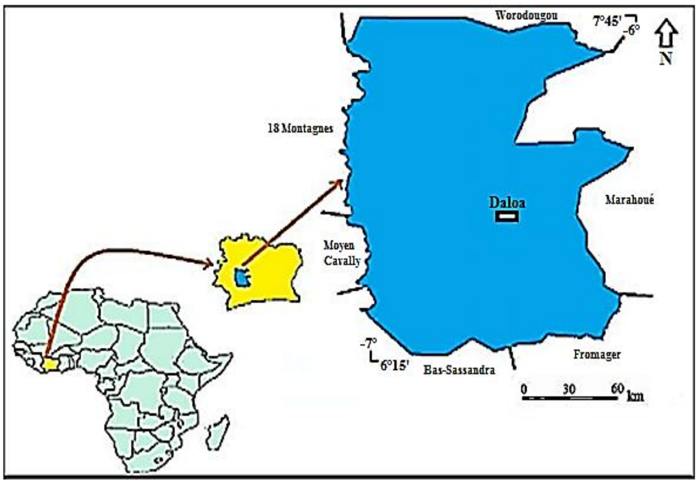


**Figure 1: Location of the study area [14]**

### 2.2 Plant material and composition of growing media

The plant material used was tomato seed of the Cobra 26 variety from the local market in Daloa.

The growing media consisted of sawdust, cashew husks, cocoa pods and rice husks. These four agricultural by-products were combined in varying proportions as shown in Table 1. The control was an unamended soil.

**Table 1: Composition of substrates**

| N° | proportion of rice husk (g/100g) | proportion of cashew film (g/100g) | proportion of cocoa pods (g/100g) | proportion of sawdust (g/100g) | *Substrates* |
|---|---|---|---|---|---|
| 1 | 20 | 60 | 10 | 10 | RJC261 |
| 2 | 10 | 70 | 10 | 10 | RJC171 |
| 3 | 10 | 80 | 0 | 10 | RJC180 |
| 4 | 0 | 0 | 100 | 0 | C100 |
| 5 | 25 | 25 | 25 | 25 | RJC333 |
| 6 | 50 | 0 | 0 | 50 | RB5050 |
| 7 | 0 | 0 | 0 | 100 | B100 |
| *Control* | 0 | 0 | 0 | 0 | *Soil* |

*B: Wood; C: Cocoa; RB: Rice-Wood; RJC: Rice-Cashew-Cocoa*

### 2.3 Experimental design and conduct of the trials

The buckets containing the substrates were arranged in randomised Fisher blocks (three blocks) with three replicates as shown in Figure 4. Each block consisted of eight (8) elementary plots. A drip system was set up to allow watering of the plants until the appearance of flower buds. Fruit harvesting started about two months after transplanting. It was done regularly every three days. At each harvest, the fruits were sorted to remove those with irregularities and/or defects. To ensure the homogeneity of the samples, the tomato fruits of each plant were picked at the same stage of maturity and kept at room temperature. Then, a sample of three tomato fruits is taken for each substrate, thus eight samples. These samples were then sent to the laboratory where they underwent various analyses.

### 2.4 Chemical characterisation of tomatoes

The chemical characteristics are water content, dry matter, total acidity and reducing sugars. The water content was determined by the AOAC [15] which is based on the loss of mass of the sample to a constant mass at 105 °C. The dry matter content is obtained as the difference between 100 and the water content. The total acid content is determined by determination with a strong base (NaOH 0.1N). The determination of the tomato sugars was carried out by the Fehling's liquor method.

### 2.5 Technological characterisation of the tomatoes

The technological characteristics evaluated are the saccharin index (ls), the saccharin coefficient (Cs) and the acidity coefficient (Ca) according to the method described by

 

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Namestnikov [16] and Verxhivker [17].The methods for calculating these indices are as follows:

The saccharine index:

$$SI = \frac{S}{A}$$

SI: saccharine index; S: Reducing sugar content; A: Acid content

The saccharine coefficient:

$$SC = \frac{S}{DM}$$

SC: saccharine coefficient; S: Reducing sugar content; DM: Dry Matter

The acidity coefficient:

$$AC = \frac{A}{DM}$$

AC: acidity coefficient, A: Acid content; DM: dry matter

### 2.6 Sensory evaluation of tomato fruits

For the organoleptic evaluation of tomato fruits, the method used is the hedonic test. This test was conducted using a tasting sheet. For each product, it includes: a visual evaluation (colour), an olfactory evaluation which can be defined as the scent felt during tasting, an estimation of the consistency and the taste (acidity, saltiness). The hedonic evaluation was carried out at the Agro Valorisation laboratory of the Jean Lorougnon Guédé University. The tasting took place in a room on carefully coded tomato slices placed in disposable plates. The sixty untrained tasters were selected from the student population and are regular consumers of tomatoes. The panel is made up of tasters aged between 20 and 30 years. The consumers are convened in groups of 6 people. After a briefing, they are placed in a booth for a sequential monadic or comparative evaluation of the tomatoes for a period of 8 to 10 minutes.

### 2.7 Statistical analysis of the data

The collected data were processed using EXCEL 2013 spreadsheet software (the spreadsheet was used to draw the graphs or figures). STATISTICA 7.1 software was then used for statistical analyses and multiple comparison tests (Tukey HSD) were conducted when the difference was found to be significant ($p < 0.05$).

## III. RESULTS

### 3.1 Chemical Characteristics of Tomatoes

The moisture content allows us to relate the results of the biochemical constituents to the dry matter. The moisture content found in the different tomato samples is very high, ranging from 94.33 ±0.58% to 96.37 ± 0.40% with the cashew skin tomatoes. The statistical study for this parameter shows that there is a significant difference ($P<0.05$), this is confirmed by Tukey's test which shows three groups with homogeneous means (a, ab, abc, bc, c). The first group has the maximum mean (96.37%) with the fruits of the substrate RJC5050, intermediates between a, b and c which follow in succession and the last group with a minimum mean of 94.33% with the fruits of the substrate C100. The acidity values obtained for the fruits ranged from 4.33±0.58% to 6.17±0.76%. A significant difference ($P <0.05$) was observed after analysis of variance, which showed two homogeneous groups (a, ab, b) by Tukey's test. Group (a) represents the highest average (6.17%) observed in the fruits of the B100 and RJC171 plants, ab is intermediate between a and b and the lowest averages (3.83 and 4.33%) respectively in the control and RJC5050 fruits. The amounts of reducing sugars in tomato ranged from 4.27 ± 0.53% to 6.27% ± 0.00 and from 6.39 ± 0.24% to 6.67% ± 0.00. The analysis of variance revealed no significant differences (Table 2).

**Table 2: Physical characteristics of the tomatoes studied**

| Substrates | Mass (g) | Seed content (%) | Density |
|---|---|---|---|
| RJC261 | $42.18±7.00^{cde}$ | $2.92±0.40^{ab}$ | $0.88±0.00^{b}$ |
| RJC171 | $36.36±0.00^{de}$ | $1.37±0.00^{b}$ | $0.88±0.26^{b}$ |
| RJC180 | $24.73±5.73^{e}$ | $1.90±0.88^{b}$ | $0.88±0.00^{b}$ |
| C100 | $90.55±0.00^{ab}$ | $2.74±0.00^{ab}$ | $0.90±0.00^{c}$ |
| RJC333 | $56.48±0.68^{cd}$ | $4.77±0.00^{ab}$ | $0.91±0.00^{c}$ |
| RJC5050 | $41.93±2.56^{cde}$ | $6.52±0.94^{a}$ | $0.93±0.02^{a}$ |
| B100 | $66.84±24.00^{bc}$ | $4.97±2.16^{ab}$ | $0.90±0.00^{c}$ |
| Control | $99.23±4.25^{a}$ | $2.62±2.38^{ab}$ | $0.90±0.08^{c}$ |

*B: Wood; C: Cocoa; RB: Rice-Wood; RJC: Rice-Cashew-Cocoa*, Means ± standard deviation followed by the same letters (a, b, c) is not significantly different at the 5% level, according to the tukey test

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### 3.2 Technological characteristics of tomatoes

The results obtained show that there is no significant difference in the saccharin index (Is) and acidity coefficient (Ca) of the fruits, with only one homogeneous group being identified. These values ranged for Is from 0.75±0.09 to 1.49±0.17 and for Ca they were between 8.22±0.19 and 12.99±2.71. For Cs, the values ranged from 83.30±15.73 to 178.65±66.39. There is a significant difference ($P<0.05$) after statistical analysis. The Turkey test confirms this by identifying three homogeneous groups (a, ab, b) in order of the high average group (178.65%) constituted by the fruits of the substrate RJC5050, followed by an intermediate group and finally the last group concerning the low average (83.30%) and presented by the fruits of the substrate RJC261. Comparing the Cs and Ca values of the fruits, it can be seen that they meet the standard ($Cs \geq 50$ and $Ca \geq 8$). As for the Cs of the fruits of the RJC5050 substrate, it is triple (178%) of the standard norm. Moreover, the fruits of the substrates RJC261 and C100 have a Ca value close to the minimum standard value (Table 3).

**Table 3: Technological characteristics of the tomatoes**

| Substrates | SI (%) | SC(%) | AC (%) |
|---|---|---|---|
| RJC261 | 0.89±0.27[a] | 83.30±15.73[b] | 9.62±1.00[a] |
| RJC171 | 0.75±0.09[a] | 93.39±8.51[ab] | 12.75±2.6[a] |
| RJC180 | 1.37±0.27[a] | 138.66±11.94[ab] | 10.42±2.5[a] |
| C100 | 1.18±0.22[a] | 97.17±19.91[ab] | 8.22±0.19[a] |
| RJC333 | 1.28±0.05[a] | 137.09±13.76[ab] | 10.76±1.39[a] |
| RJC5050 | 1.49±0.17[a] | 178.65±30.63[ab] | 12.00±1.81[a] |
| B100 | 1.09±0.13[a] | 122.25±32.77[ab] | 12.99±2.71[a] |
| Control | 1.75±0.99[a] | 156.5±66.39[a] | 9.49±1.50[a] |

*B: Wood; C: Cocoa; RB: Rice-Wood; RJC: Rice-Cashew-Cocoa*, SI: Saccharose index; SC: Saccharose coefficient; AC: Acidity coefficient, Means ± standard deviation followed by the same letters (a, b, c) is not significantly different at the 5% level, according to the tukey test

### 3.3 Sensory characteristics of the tomatoes

The sensory analysis described the colour (red, orange, yellow), taste (bland to salty), consistency, aroma and juiciness of the tomatoes (Figure 2).

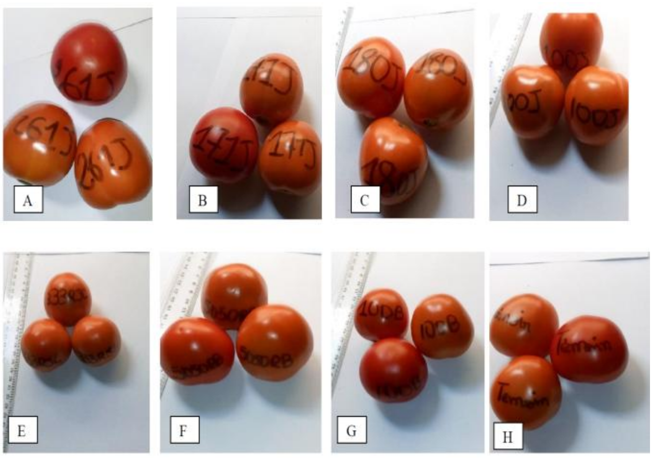


**Figure 2: Tomato fruit by substrate**

*A: Tomato fruit of plant RJC261; B: Tomato fruit of plant RJC171; C: Tomato fruit of plant RJC180; D: Tomato fruit of plant C100; E: Tomato fruit of plant RJC333; F: Tomato fruit of plant RJC5050; G: Tomato fruit of plant B100; H: Tomato fruit of control plant*

#### *3.3.1 Tomato colour*

It was found that 61.11% of the respondents thought that the tomato fruits of the RJC261 plants were orange, compared to 11.11% for whom these fruits were red. As for the fruits of RJC171, 66.67% of the tasters mention that the tomato fruits are orange, against 22.22% who find them red and yellow for 11.11%. 66.67% of the reviewers said that the fruits from RJC180 were red, while 33.33% of the reviewers said they were yellow. Regarding the results of the sensory test of the tomato fruits obtained by the C100 plant, the analysis reveals that 66.67% of the tasters mention that the tomato fruits are orange, against 16.67% who find them red. The analysis of the table shows that 55.56% of the respondents found the tomato fruits of the RJC333 plant orange, against 5.56% for whom these fruits were red. After analysis, it is noted that according to the examiners, the fruits of the RJC5050 plant are yellow for 38.89% and orange for 55.56% against 5.56% who find them red. The same table shows that 66.67% of the tasters found the tomato fruits from the B100 plant to be orange, with 33.33% finding them red. For the control fruits, 88.89% of the tasters reported that the fruits were orange, while 11.11% found them red (Figure 3).

 

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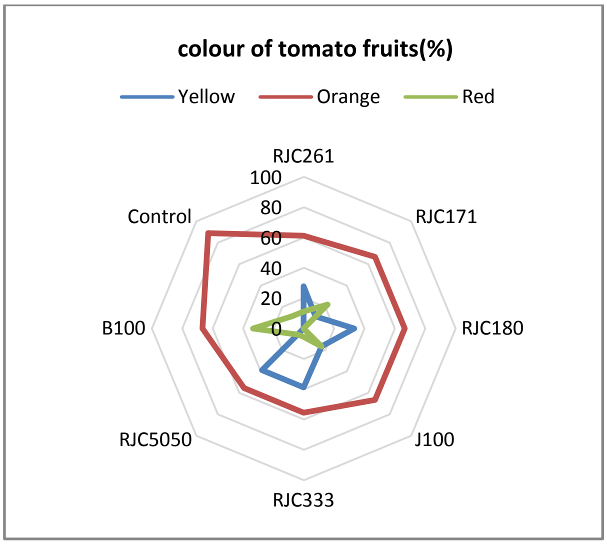


**Figure 3: Jury's assessment of the colour of tomato fruits**

### *3.3.2 Tomato aroma*

The aroma of the tomatoes was assessed differently by the respondents. According to Table VIII, 44.44% of the examiners stated that the fruits of the RJC261 plant had a strong aroma, compared to 33.33% who described it as weak, and 22.22% as weak. It should be noted that 50% of the tasters reported that the fruit produced with the RJC171 substrate had a strong aroma, while 27.78% of these reported a weak aroma. The table also shows that 55.56% of the reviewers reported that RJC180 fruit had a weak aroma and only 22.22% of the panel reported that it was strong. The same table shows that 27.78% of the people who report that the fruits of C100 have a strong aroma, while 55.56% of them describe it as weak and 16.67% as weak. For the tomatoes of RJC333, the analysis reveals that 8.89% of the examiners declared that the fruits obtained have a little pronounced aroma, against 33.83% who qualify it as pronounced, and 27.78% not pronounced. The same table shows that 16.67% of the tasters found that the aroma of the tomato fruits of the RJC5050 was not pronounced, compared to 55.56% who said that the aroma was not very pronounced and 27.78% who said it was pronounced. Regarding the B100 tomatoes, it should be noted that 66.67% of the evaluators underlined that the fruits produced have a pronounced aroma while 16.67% of them find them very pronounced. With regard to the control fruits, 33.33% of the people reported that the fruits have a pronounced aroma while 44.44% of them described it as not very pronounced and 22.22% as not pronounced (Figure 4).

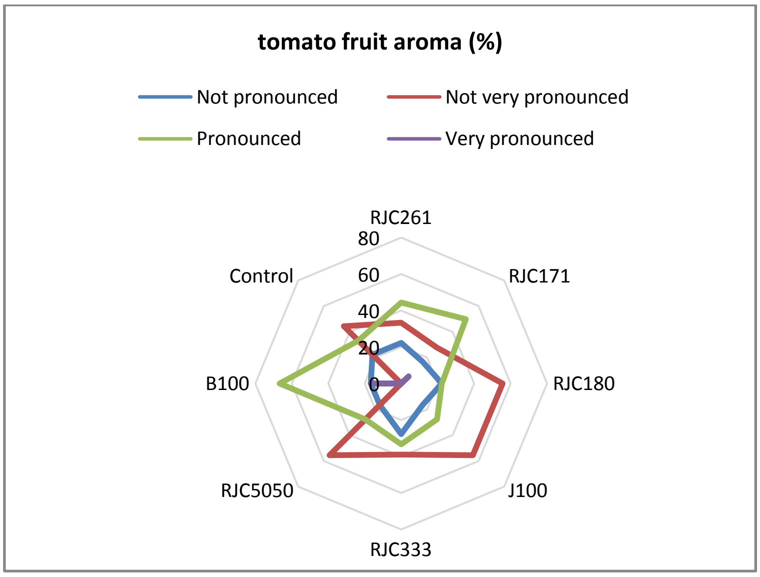


**Figure 4: Jury's assessment of tomato fruit aroma**

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#### *3.3.3 Taste of tomatoes*

Taste was also assessed differently by the respondents, with 66.66% of the tasters indicating that the tomato fruits obtained from the RJC261 plants were not very salty, with 22.22% considering them simply salty. As for the taste of the tomatoes from RJC171, 22.22% of the tasters said that the tomato fruits were salty, while 61.11% said that they were not very salty. Also, 88.89% of the same panel found the tomatoes of RJC180 to be slightly salty and only 11.11% characterised them as bland. Regarding the taste of the C100 tomatoes, 44.44% of the tasters said that the tomato fruits were not very salty, while 11.11% said they were salty. From the same table, 66.67% of the tasters indicated that the tomato fruits obtained from the RJC333 substrate are not very salty, with 27.78% finding them bland and only 5.56% characterising them as salty. After analysis, it is noted that according to the tasters, the tomato fruits of the RJC5050 plants are not very salty for 66.67% against 16.67% who find them salty or bland. Regarding the taste of the B100 tomatoes, 83.33% of the tasters reported that the tomato fruits were not very salty, compared with 16.67% who found them bland. For the control tomatoes, 88.89% of the tasters noted that the fruits were not very salty, compared to 11.11% who did not find them salty (Figure 5).

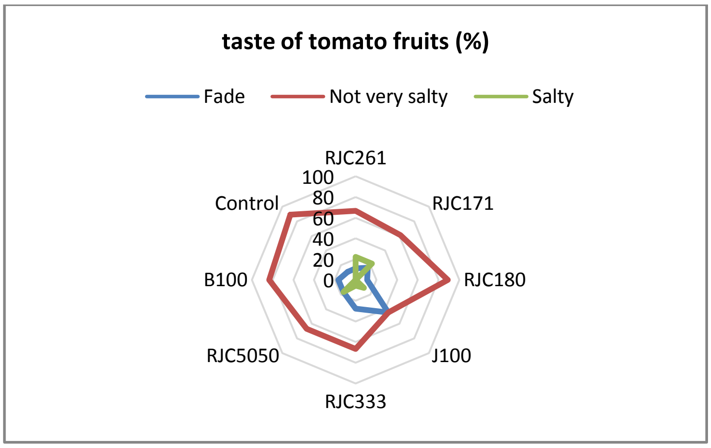


**Figure 5: Jury's assessment of the taste of tomato fruits**

#### *3.3.4 Juiciness of tomatoes*

From the analysis of Table X, it appears that almost half (55.56%) of the respondents find the fruits of the substrate RJC261 not very juicy against 27.78% who find them juicy and not juicy for 16.67%. In addition, 16.67% of the raters revealed that RJC171 tomato fruits are not juicy, 55.56% not very juicy, 22.22% juicy and only 5.56% consider them very juicy. Only 33.33% of the reviewers find RJC180 tomatoes juicy, 55.56% not very juicy and 11.11% not juicy. In addition, 66.67% of the reviewers revealed that C100 tomato fruits are not very juicy, juicy for 16.67% of them. From the same table, 72.22% of the respondents find the fruits of RJC333 not very juicy against 16.67% who find them juicy. For the tomato fruits of RJC5050 plants, 55.56% of the tasters rated them as not very juicy, 33.33% as juicy and 11.11% as not juicy. 50% of the reviewers mentioned that the tomato fruits of plant B100 are not juicy, 33.33% juicy, 16.67% not very juicy. For 55.56% of the assessors the control fruits are juicy, 44.44% find them not very juicy (Figure 6).

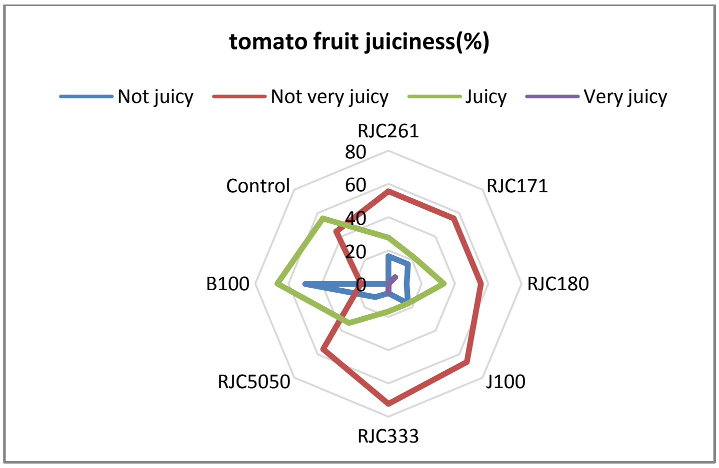


**Figure 6: Jury's assessment of tomato fruit juiciness**

 

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### *3.3.5 Consistency of tomatoes*

The analysis of Table XI reveals that the consistency of the fruit is also an appreciable quality criterion, while 44.44% of the respondents find the tomatoes of RJC261 consistent and not very consistent, 11.11% do not find them consistent. As for the fruits of RJC171, 44.45% of the examiners found them consistent, 38.89% not very consistent, 5.56% very consistent and 11.11% not consistent. Note that for RJC180 fruit, 33.33% of the tasters said it was consistent, 61.11% said it was not very consistent and 5.56% said it was not consistent. For C100 tomatoes, 55.55% of the tasters found the fruit consistent, 33.33% found it not very consistent and only 11.11% found it not consistent. Concerning the RJC333 fruits, while 38.89% of the respondents found them consistent and not very consistent, 5.56% found them not consistent. After analysis, it can be seen that according to the tasters, the tomato fruits of the RJC5050 plants are consistent for 50.00% and not for 38.89%. 66.67% of the tasters consider the fruits of the B100 to be consistent, as opposed to 16.67% who find them not very consistent. 72.22% note that the control fruits are not very consistent and only 27.78% say that they are not consistent (Figure 7).

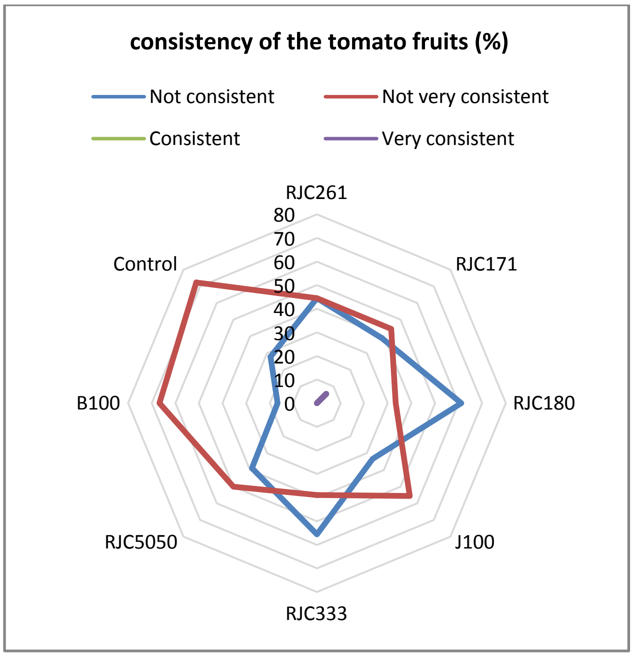


**Figure 7: The jury's assessment of the consistency of the tomato fruits**

## IV. DISCUSSION

The total acidity of the fruits was different at ($p<0.05$). Indeed, it is a good estimator of the organic acid content of tomato fruits [18] (Granges et al., 2000). Our work showed that the total acidity according to the recorded substrate composition was between 3.83 and 6.17%. These values are higher than those reported by Granges et al. [19]; Abbayes et al. [20] and Agassounon et al. [21].Their values ranged from 2.60 to 5.8 g/l. This difference could be explained by the fact that during tomato ripening, the acid content (mainly citric and malic) decreases in favour of increasing sugar content, thus harvested ripe tomatoes have a low acid content. It could also be attributed to genotypic characteristics and ecological parameters.

The water composition of the fruits ranged from 94.33 ± 0.58% to 96.37 ± 0.46%. These results differ from those of Pinela et al. [22] this difference is due to the different substrates used. Indeed, these authors showed tomato water contents ranging from 90.63 to 93.70%. These water contents are also different from those reported by Sulbarán et al. [23] and FAO [24]. These authors found water contents between 93.50% and 94.60%. The high water content of tomato fruits would explain their perishable nature. This could limit its conservation at room temperature for a long period [21].

The dry matter contents less than or equal to 5% (from 3.63 to 5.67%) for all fruits are below the theoretical value of more than 5%, retained by Fagbohoun& Kiki [25].However, these dry matter contents obtained for these fruits are similar to the results of Dossou et al. [26].who obtained 4 to 5% dry matter in their study in Benin.

With regard to reducing sugars, our recorded values were 5.16% and 6.49% which differs from the work done by Sherman et al. [27] who reported values of 4.97% and 5.08%. The results obtained show that the fruits studied have a high sugar content compared to the data of these authors. Indeed, a high sugar content in tomatoes is a sign of good taste and flavour.

According to Verhivker [17], the best taste of tomatoes is obtained when the Saccara Index (Is) is greater than or equal to 7. Tomatoes with a Saccara Index below 7 cannot be recommended for industrial processing, but as a table tomato. The results of the saccharine indexes of the tomatoes studied are in discordance with the prescribed standards. For all fruits studied, the values are between 0.78 and 1.49%. These values are very low, which means that the technological quality of these fruits is poor. As for the values of saccharin coefficient (83.3 to 178.75%) and acidity (8.22 to 12.99%), they vary from one fruit to another. Some countries, notably Poland, France and Bulgaria, have established standard norms for these coefficients. For these countries, the saccharine coefficient is greater than or equal to 50 and the acidity coefficient less than or equal to 8. This means that in order to guarantee good technological quality, the soluble dry matter must contain more than 50% sugars and less than 8% acids. Our values meet the standard and are similar to those of Fagbohoun& Kiki [25]. The values of these authors are

 

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between 53 and 62% for the saccharin coefficient and 9.4 to 15% for the acidity coefficient.

For the sensory characteristics of substrate-produced tomato fruit, the reviewers' perceptions vary widely depending on the criteria selected (colour, aroma, taste, juiciness and consistency). Indeed, individual differences imply variations in the response of different subjects to the same stimulus. Furthermore, the quality of tomato fruits is based on organoleptic criteria as Dossou et al. [26].pointed out in their study on tomato paste production in Benin, with which our results are slightly different. This difference could be due to the method and the product used for the sensory analysis [28].According to the evaluators of these authors, their products were red, salty, consistent with a pronounced aroma, whereas the tomato samples submitted to the sensory analysis in our study were orange in colour, with a pronounced or not very pronounced aroma, not very salty, not very juicy and not consistent or not very consistent. It can be seen that the tomatoes produced by the cashew skin and sawdust plants have almost the same sensory characteristics. It should be noted that taste, colour, shape and consistency are all important criteria for fresh tomatoes. Indeed, the most important criterion is the colour; it is this parameter that guides the choice of a tomato from a batch. A specific carotenoid, lycopene, gives tomatoes their red colour. Higher levels of beta-carotene are responsible for an orange colour. In this study the perceived aroma and taste criteria could be due to the constituents of the substrates used. Also the juiciness and consistency due to moisture levels.

## V. CONCLUSION

The values of the saccharin index (1.15%), saccharin coefficient (121.5%) and acidity (8.29%) are recorded. The sensory study of the tomatoes reveals that the tasters perceived sensory differences between the tomatoes. However, their overall perception of the tomatoes confirms their good acceptability. Also taste, colour, shape and consistency are important criteria of fresh tomatoes. At the end of this study, it is noted that the C100 substrate presented the best physicomorphological parameters. All substrates had better chemical characteristics.

Technologically, tomatoes from the RJC5050 and B100 substrates can be recommended for industrial processing. However, tomatoes from other substrates are intended for domestic consumption. However, the tomatoes from all these substrates showed the same sensory characteristics.

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## DISCLOSURE OF CONFLICT OF INTEREST

All the author declares no conflict of interest.

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