EVALUATION OF HEINZ TOMATO VARIETIES FOR PROCESSING AT TWO IRRIGATED SITES

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PREFACE

This study was undertaken in response to a technical information request by the Ministry of Food and Agriculture for the evaluation of some tomato varieties. Eighteen introduced and three local varieties were used for the field trials. Of the twenty-one varieties planted, ten gave good field data and yields. These were harvested when 75% of the field was at ripped-red stage. The fruits were air-freighted from Bolgatanga to Accra for analysis at the Food Research Institute.

INTRODUCTION

Lycospersium esculentum is used extensively either as in the fresh state in salads or in cooking. Its desired feature is the chemical composition which is related to the cultural factors such as seasonal weather conditions, permanent vinery factors such as soil type, age at harvest and variable factors such assoil management, spraying programmes and fertiliser practices. Winsor *et al* (1962) reported changes in composition with ripeness of tomatoes and concluded that the taste was mainly due to the sugar and acid content.

Tomato processing like any food industry requires the use of sound raw material. Tomato for canning should be moderately large, smooth for easy peeling, evenly ripened of a clear red colour and possessing a large proportion of pulp of good flavour. Tomato of irregular shape and wrinkled skins are difficult to peel with subsequent high loss during preparation. Tomato varieties with large seed cavities soften badly during canning, whilst soft, watery varieties are not used due to its low soluble solid content. Neither are yellow and purple coloured tomatoes, nor lack of uniformity in ripeness accepted in the tomato processing industry (Cruess 1966). Thus, the quality of tomato products depends to a large extent on the colour and its retention of the natural red colour.

Appearance, colour and flavour of the tomato fruit are subjective quality attributes which influence consumer acceptability, whilst fruit acidity, pH, total solids, lycopene content etc. are objective attributes which greatly influence the final quality of fresh tomato for processing.

In Ghana, the bulk of tomato consumed is cooked in the daily meal. The commodity is cultivated in all the ten regions of Ghana. However, the fresh tomato is not available throughout the year, especially during the period between April and July. Tomato paste thus serves as an ideal substitute during the scarcity period.

In 1966, the three Ghanaian Canneries at Nsawam, Wenchi and Pawlungu provided only 3% of the country's total consumption of tomato products. Schurmann (1967) revealed that the locally produced tomato paste was inferior to any of the imported brands with regard to colour, texture, smell and taste. The local industries used any available tomato fruit which was the wrong type of raw material for processing. It had corrugated surface, hard core, many seeds, low total solids and pale orange-red coloured pulp. Poor raw material, coupled with obsolete equipments and technologies led to the collapse of the canneries.

In order to revamp the collapsed tomato canning industry in the Northern Ghana, the Ministry of Food and Agriculture (MOFA) collaborated with the Irrigation Company of the Upper Region (ICOUR) to evaluate eighteen varieties of tomato seeds supplied by Heinz and three local varieties. The quality evaluation of ten promising varieties at two irrigated sites at Tono and Vea are discussed.

MATERIALS AND METHOD

Ten varieties of tomatoes in four replicates each were harvested on the 8th March 1998 from Tono and Vea irrigated sites in the Upper East Region. The varieties were H3044, H9665, ROMA VFN, VIS, H9314, H9491, H9553, H9478, H7151, and H9036.

Sampling

The number of fruits in 1.3 kg of the varieties was determined for each of the location and replicates. Three of the fruits from each variety and replicates were washed in cold water and macerated using a mortar and pestle after cutting the fruits to remove the seeds with a stainless steel knife. The macerated samples were sieved to obtain the pulpy juice, which were analysed.

pH

This was determined for the whole pulp for each of the varieties using the Griffin Digital pH meter standardised with pH 6.86 and 4.01 buffer solutions.

Brix

The brix value of the pulp obtained from the varieties used were determined using Abbe Refractometer type 60ED.

Total Soluble Solids

Percent soluble solids were evaluated for the fresh fruit using results from Abbe Refractometer type 60ED.

Total Titratable Acidity

The total titratable acidity was determined by using 10ml of the pulp. It was diluted with 50ml of distilled water in a 100 ml Erlenmeyer flask. Two drops of phenol phthalein indicator were added and the whole titrated against 0.1M sodium hydroxide. The total titratable acidity was then calculated as mg citric acid from, the litre values obtained.

RESULTS AND DISCUSSION

The results of the analysis done are shown in Tables I and II.

Table 1 which represents data from Tono showed that the variety H9314 had the highest number of fruits in 1.3 kg of the fruit (26.50 ± 3.0) whilst H7151 had the least number of fruit (16.25 ± 0.95). However, H9553 and Roma VFN had the same number of fruits in 1.3 kg of the fruit ie. 25.25. The number of fruits gave an idea about the size of the fruits.

Varieties from Vea again had H9314 having the highest number of fruits in 1.3 kg thus a value of 25.0 ± 2.16. On examination the H9314 from Tono was more pulpy. Like Tono variety H7151 from Vea also had the least number of fruits in 1.3 kg ie. (13.5 ± 1.0). Using Table I, varieties H9491 and H9553 had the highest Brix value. These were 3.75 ± 0.19 and 3.75 ± 0.37 respectively. The Brix values from Vea were slightly higher. Variety H9665 had a high value of $4.05^{\circ} \pm 0.10$ from Vea as compared to 3.70 ± 0.47 from Tono. These differences could be dependent on the soil type, seasonal weather conditions, night and day temperature, soil management and fertiliser practice.

The main desirable characteristic for tomato processing are a high yield of pulp, low acidity and high sugar content. As tomato ripens, the sugar content also increases (Winsor *et al*, 1962). High total soluble solids directly influence the flavour, concentration and yield of the final product of tomato (Mattews, 1977).

The changes in titratable acidity and hence the pH are mainly due to changes in citric and malic acid. The pH of tomatoes ranges from 3.6-4.8 (Ihekoronye and Ngoddy, 1992). Using the accepted pH range recommendation, for processing, it was only H9553 from Tono which was unsuitable. Comparatively, the pH values for the values for the varieties from Tono are lower than those from Vea but since pH is not the only quality attribute for processing the other characteristics such as high yield of pulp and high sugar content needs to be considered.

The total titratable acidity of juices increased significantly as the fruit ripens from green to pink but declines at red stage H9665 was acidic with value 0.47mg $\pm$ 0.05 whereas H7151 had a low acid value of 0.33mg $\pm$ 0.02 (Table I). Meanwhile Table II showed that H9553 and Vis from Vea had values of 0.39mg $\pm$ 0.03 and 0.39 $\pm$ 0.04 respectively and H9036 and H9314 were 0.37mg $\pm$ 0.02. The total titratable acidity values were quite close.

CONCLUSION

Using the data for this dry season it can be concluded that the sugar content of the varieties from Vea were found to be higher than from Tono. It can therefore be recommended that at Tono varieties H3044, H9036, H9553, H711, H9665 and H9491 had high fruit setting and good quality potential whilst H9314, H9553, H9036, H9491 and Roma VFN favoured the ecology at Vea. Variety H9491 gave good response at both localities.

Table 1: Quality characteristics of ten tomato varieties grown at Tono

Location *(TONO)*	Variety	No. fruits in 1.3kg	Brix	pH	TotalTitratable Acidity mg citric /100g of fruit	Total soluble Solids (%)
1	H3044	(19.75) ± 4.42	(3.27) ± 0.32	(4.18) ± 0.02	(0.35) ± 0.03	0.009
2	H9665	(17.25) ± 1.82	(3.70) ±0.47	(4.26) ± 0.02	(0.47) ± 0.05	2.505
3	H9491	(17.25) ± 2.5	(3.75) ± 0.19	(4.25) ± 0.02	(0.44) ± 0.03	2.848
4	H9553	(25.25) ± 3.59	(3.75) ±0.37	(4.47) ± 0.18	(0.39)± 0.04	2.848
5	H7151	(16.25 ± 0.95	(3.25) ± 0.19	(4.39) ± 0.11	(0.33) ± 0.02	0.009
6	H9478	(22.75)± 1.50	(3.40) ± 0.14	(4.17) ± 0.07	(0.39) ± 0.07	0.428
7	VIS	(17.25) ± 2.21	(3.35) ± 0.70	(4.17) ± 0.11	(0.36) ± 0.08	0.078
8	H9036	20 ± 2.58	2.92 ± 0.09	4.23 ± 0.07	0.42 ± 0.01	0.009
9	ROMAVFN	25.25 ± 2.50	3.35 ± 0.44	4.25 ± 0.87	0.42 ± 0.02	0.009
10	H9314	(26.50) ± 3.0	(3.40) ± 0.16	(4.21) ± 0.04	(0.41) ± 0.07	0.428

[1]Each value is a mean ± standard error of 4 replicates

Table 2 Quality characteristics of ten tomato varieties grown at Vea.

Location	Variety	No. of fruits In 1.3kg	Brix	pH	Total titratable Acidity mg citric /100g fruit	Total soluble Solids (%)
VEA						
1	H3044	17.50) ±1.73	(3.35) ± 0.55	(4.30) ± 0.03	(0.32) ± 0.03	0.078
2	H9665	(14.25) ± 0.50	(4.05)± 0.10	(4.29) ± 0.03	(0.33) ± 0.04	0.009
3	H9491	(15.75)± 1.71	(3.30) ± 0.25	(4.23)± 0.04	(0.36) ± 0.04	0.009
4	H9553	(21.50)± 1.00	(3.25) ± 0.34	(4.31) ± 0.05	(0.39) ± 0.04	0.009
5	H7151	(13.5) ± 1.00	(3.92) ± 0.79	(4.26) ± 0.02	(0.33) ± 0.02	4.008
6	H9478	(22.75) ± 3.20	(3.80) ± 0.23	(4.37) ± 0.12	(0.36) ± 0.03	3.190
7	VIS	(19.25) ± 0.96	(3.50)± 0.66	(4.26) ± 0.06	(0.39) ± 0.03	1.124
8	H9036	(18.75) ±2.62	(4.00)± 0.08	(4.22) ± 0.03	(0.37) ± 0.02	4.550
9	ROMA VFN	(20.0) ± 2.16	(3.50) ±0.47	(4.36) ± 0.02	(0.29) ± 0.06	1.124
10	H9314	(25.0)± 2.16	(3.52) ± 0.34	(4.28)± 0.04	(0.37) ± 0.02	1.263

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