Madras Agric. J., 94 (7-12) : 290-294 July-December 2007
https://doi.org/10.29321/MAJ.10.100710

Research Notes

Studies on the effect of chemical treatments on Dehydrated Tomato

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Post harvest losses are considerably high in India. Dehydration technology plays a vital role in the preservation of fruits and vegetables, by converting them to a stable form that can be stored throughout the year. Tomato is an important seasonal vegetable widely grown in India. It contains 0.9% protein, 48% calcium and 3.6% carbohydrates and offers 20 Kilocalories of energy (ICMR, 1992).

Fruits and vegetables are usually subjected to certain pre- treatments before drying in order to minimize adverse changes during drying and subsequent storage. Mathee *et al.* (1978) reported that blanching intended to denature or inactivate enzymes adversely affecting product quality. The most common and least expensive method to prevent enzymatic browning in fresh prepared vegetables is by the use of sulphiting agents (Roy and Choudary, 1972).In sulphuring of tomatoes no heat injuries occurred at 60°C (Ramirez *et al.*, 1997). Treatment with calcium salts alter pH and improve resistance (Hoogzand and Doesburg, 1992). Pretreatment of vegetables with dextrose improves rehydration of materials. (Curry *et al.*, 1996). Increased water permeability of blanched tissues results in increased constant rate drying period and increased drying rates. (Levi *et al.*, 1988). Drying process makes the material visco elastic, capable of deformation and the amount of evaporated water is reflected by change in volume, referred to as *'shrinkage'*. Hence, the study was to identify the best treatment for tomatoes and to determine the drying characteristics of tomatoes to plot the drying curves.

Freshly harvested tomatoes of Gotya variety, procured from local market, with uniform bright red colour, smooth surface and firm texture were obtained. The cleaned tomatoes were cut to 10 x 10 x 10 mm sized pieces.

The tomato pulp after removal of seeds were analysed for pH.

Acidity was determined by titrating against Sodium Hydroxide using the formula

$$\text{Acidity} = \frac{\text{ml of Sodium Hydroxide} \times \text{Normality of Sodium Hydroxide} \times 64}{\text{Weight of sample (grams)} \times 10}$$

The Total soluble solids of tomato pulp were determined by using a hand refractometer. The refractometer was calibrated with water initially and then tested for total soluble solids in tomato pulp.

Drying process was preceded by specific treatments including sulphiting (800,900,1000 and 1200 ppm SMBS) and immersing in solutions such as calcium chloride (1%) and dextrose (5,8 and 12%).

Table 1. Bio-chemical analysis of dehydrated tomato samples

Experi ment	Treated with 800 ppm SMBS and l%Calcium chloride	Treated with 900 ppm SMBS and l%Calcium chloride	Treated with 1000 ppm SMBS and l%Calcium chloride	Treated with 1200 ppm SMBS and l%Calcium chloride	Treated with 900 ppm SMBS and l%Calcium chloride and 5% dextrose	Treated with 900 PPm SMBS and l%Calcium chloride and 8% dextrose	Treated with 900 ppm SMBS and l%Calcium chloride and 12% dextrose
Moisture content	4.42	5.06	5.78	4.69	5.66	5.30	5.25
Reducing sugars	8.42	7.84	8.15	8.91	8.53	9.42	8.96
Crude fibre	6.21	6.76	7.02	6.34	6.49	6.83	5.94
Crude fat	0.42	0.38	0.45	0.39	0.44	0.42	0.41
Total ash	6.45	6.49	6.75	6.51	6.64	6.59	6.32
Acid insoluble ash	0.244	0.236	0.256	0.26	0.272	0.261	0.258

Table 2. Rehydrated sample evaluation

Treatments	Weight before Rehydration (grams)	Weight after Rehydration (grams)	Rehydration Ratio
Treated with 800 ppm SMBS and l% Calcium chloride	2	7.62	3.81
Treated with 900 ppm SMBS and l% Calcium chloride	2	7.4	3.7
Treated with 1000 ppm SMBS and l% Calcium chloride	2	8.02	4.01
Treated with 1200 ppm SMBS and l% Calcium chloride	2	7.14	3.57
Treated with 900 ppm SMBS and l% Calcium chloride and 5% dextrose	2	8.09	4.05
Treated with 900 ppm SMBS and l%Calcium chloride and 8% dextrose	2	8.82	4.41
Treated with 900 ppm SMBS and l%Calcium chloride and 12% dextrose	2	7.4	3.71

Drying of the pretreated material was done in a hot air oven at 55-60° C and relative humidity of 40-50% for 5-6 hours. Packing of the dehydrated products was done in moisture proof polyethylene bags and sealed airtight.

Analyzing the dehydrated product for the following, did optimization of the best chemical pre-treatment:

i. **Moisture content:** Initially, 100 grams of the dehydrated product was dried (W_1 g) in a vacuum air oven at 70°C and 25 mm Hg till constant final weight (W_2 g) was obtained.

% Moisture content =

$$\frac{W_2 - W_1}{W_1} \times 100 \qquad (1)$$

ii. **Total Ash:** The weight of the crucible was taken to be (W g) 3 grams sample, (W_2 g) grams ,was heated in a muffle furnace at 550 ± 20°C until the resulted ash (W_1 g) grams gave uniform values.

Percentage Total ash =

$$\frac{(W_1 - W_2)}{(W_1 - W)} \times 100 \qquad (2)$$

iii. **Acid Insoluble ash:** The ash obtained was heated on a water bath for 10 minutes. The contents of the dish, of weight, (A_2) grams, were allowed to cool, filtered and washed with water. It was dried at 100 ± 2°C for 3 hours in a hot air oven. It was then ignited in a muffle furnace at 550 ± 10°C for 1 hour. The dish was cooled in a dessicator and weighed to be (A_1) grams until concordant values were obtained. The weight of the empty dish is taken to be (A) grams.

Acid Insoluble ash =

$$\frac{(A_1 - A_2)}{(A_1 - A)} \times 100 \qquad (3)$$

iv. **Crude Fibre:** The residue after analyzing for acid insoluble ash, was washed with boiled water and then with 15 ml of alcohol. The crucible and the contents were dried at 110°C to a constant weight. The dish was cooled in a dessicator and weighed until concordant values were obtained.

Percentage Crude Fibre =

$$\frac{\text{Loss in weight noted (grams)}}{\text{Initial weight of dehydrated sample (grams)}} \times 100 \qquad (4)$$

v. **Rehydration Ratio:** The weight gained by the dehydrated product on reconstitution is measured.

Rehydration Ratio =

$$\frac{\text{Final weight of rehydrated sample (grams)}}{\text{Initial weight of dehydrated sample (grams)}} \times 100 \qquad (5)$$

Among the various concentrations, 900 ppm SMBS was found to be effective. By using calcium chloride the best concentration was evaluated to be 1 percent. The biochemical characteristics, as given in table 1, were found to be acceptable at a combined chemical treatment of for tomatoes treated with 900 ppm SMBS and 1% calcium chloride and 8% dextrose.

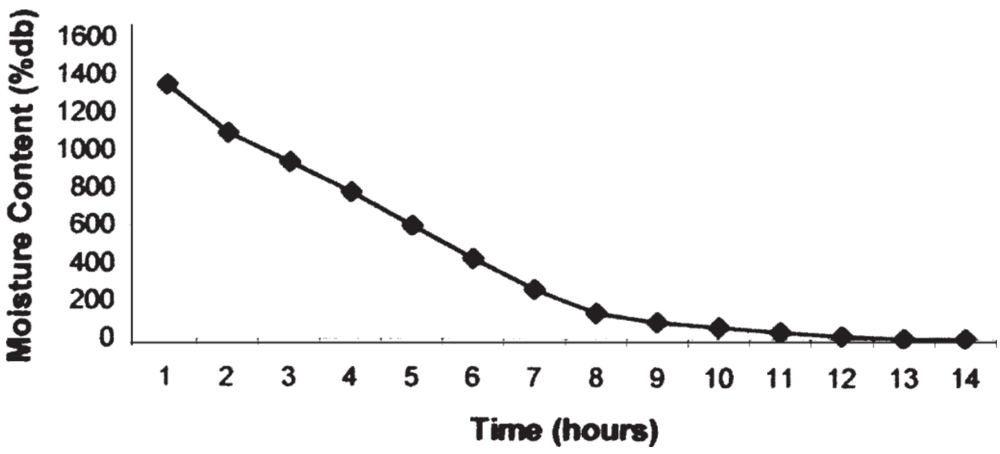

Fig.1 Drying characteristics curvs for Tomatoes treated with 900 ppm SMBS and 1 % Calcium chloride and 8% dextrose.

Drying Characteristics:

The moisture content of various chemically treated tomato samples were studied. The final moisture content of the product ranged from 4-6%.Lower the moisture content ,higher the keeping quality of the product. In the early period of drying, there was a rapid decline in the moisture content for all the pieces of tomatoes. Drying characteristic curves for tomatoes treated with 900 ppm SMBS and 1% calcium chloride and 8% dextrose are given in fig. 1

Rehydrated sample evaluation:

Rehydration is the phenomenon that decides the effectiveness of the final product. The result of rehydration of the chemically treated samples is given in table 2.

Retention of the natural colour and better shape gain, were observed in the best-selected sample after rehydration. Nearly 3.5 - 4.5 fold increase in volume of the rehydrated samples was observed.

Biochemical analysis showed that, the total ash content was found to increase as the percentage of dextrose levels increases. Treatment with 1200 ppm SMBS and 1% calcium chloride had an increased crude fat level, that caused a higher level of discolouration in the dehydrated sample. Reducing sugar levels were the highest in the best-treated sample.

The best chemical treatment was found and the drying rate curves were drawn. The rehydration ratio was found to be high for the chemically treated samples.

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Madras Agric. J., 94 (7-12) : 294-296 July-December 2007

A Ground Water quality of Thiruchirapalli district, Tamil Nadu

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In Tamil Nadu, surface water flows are diminishing due to monsoon failures, decline in storage capacities of tanks due to encroachment, silting *etc.*, leading to over exploitation of ground water. This led to lowering of groundwater table, increasing the pumping costs and change of water quality. Of the total geographical area of 13 M. ha, 5.46 and 2.97 M ha are the net area sown and area under irrigation respectively. Among the different sources of irrigation, well irrigation contributes 54.7 per cent followed by canal irrigation (26.6%) and tank irrigation (18.3%). Among the 30 districts of Tamil Nadu, well irrigation is the dominant source in Thiruvannamalai (97.9%), Salem (93.5%), Vellore (92.5%) and Perambalur districts (92.3%).

Hence a survey was made to assess the suitability of underground water both from open and bore wells at every revenue village of Thiruchirapalli district. Thiruchirappalli district with an area of 4,40,412 ha has been subdivided in to eight taluks comprising 483 revenue villages. The water samples, collection from all the revenue villages were analysed for pH, EC and cationic and anionic composition and the quality parameters like Residual Sodium Carbonate (RSC) and Sodium Adsorption Ratio (SAR) were computed. The irrigation water suitability was assessed based upon the criteria developed by AICRP on saline water (1991) as follows.