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Influence of dehydration temperature and pretreatment to control browning and preservation of onion flakes

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Abstract : Influence of dehydration temperatures and pre-treatment levels to control browning and preservation were assessed by dehydrating Pusa White onion slices at 50°, 60° and 70°C temperatures with 0.2, 0.3 and 0.4 per cent of potassium metabi-sulphite as a pre-treatment. The time required for dehydration was comparatively lesser for the pre-treated samples than control in all the selected temperatures. From the biochemical analyses it was observed that the ascorbic acid retention was comparatively higher at 50°C with 0.4 percent sulphitation level; the sugar content was significantly higher at 50°C in control samples and the non-enzymatic browning was comparatively lesser at 60°C with 0.3 percent sulphitation level. From the organoleptic study it was observed that the onion flakes dehydrated at 60°C with 0.3 percent sulphitation level scored the maximum points. A progressive increase in moisture content, reduction in ascorbic acid and rehydration ratio were also observed during storage. *(Key words : Dehydration, Sulphitation, Non-enzymatic browning, Organoleptic evaluation).*

Consumption of dehydration onion flakes is becoming more popular in recent days. There are several dehydration units in India which produce dehydration onion flakes for export and for domestic consumption. During the commercial dehydration of white and red onion flakes, pink discolouration or browning adversely affect the quality of dried product. Therefore, control of Pink discolouration is very much important to attract the consumer and also to compete in international market. To control browning, food preservative such as potassium metabi-sulphite (KMS) with various levels were selected in such a way that there should not be any harmful effect on onion flakes. The other factor chosen was different range of temperature in order to evaluate the influence of temperature on discolouration and preservation of onion flakes. Several authors have investigated the dehydration of onion. But these studies were mostly concerned with evaluation of drying characteristics, varietal differences in the quality of the dehydrated product. But the information on the related aspects of pretreatment levels, optimum drying temperature to improve the shelf life of dehydrated onion flakes were very limited. Therefore the present study was taken up.

Materials and Methods

Pusa White round variety was procured from the market, for the experimental study.

Physio-Chemical analyses

Good quality bulbs were selected for physio-chemical analyses. The diameter and length of the onions were measured with a vernier caliper having a least count of 0.02 mm and the weight was measured with an electronic balance having a least count of 0.01g. Moisture content was determined by drying the sample in a vacuum oven at 100°C to constant weight. Ascorbic acid content was estimated by titrating a known weight of the sample with 2,6 dichlorophenol indophenol dye (Sadasivam and Manickam, 1990). Total solid matter was determined by washing onion paste free from soluble matter with water on a weighed filter paper and drying it in the oven at 100°C to constant weight (Osborne and Voogt, 1978). Total sugar in onion was determined by taking an aliquot of the excess acid with sodium carbonate (Sadasivam and Manickam, 1990). Browning of dehydrated onion flakes was measured in terms of optical density at 420nm by an aliquot extract of 100 per cent alcohol.

Table 1. Physio - chemical characteristics of Pusa White onion

Particulars	Pusa White onion
Average weight (g)	58.31
Average length (cm)	5.21
Average diameter (cm)	5.17
Moisture content (Wb%)	87.80
Total solids (%)	12.20
Ascorbic acid (mg/100g)	10.50
Total sugar (%)	6.12

Table 2. Dehydration characteristics of white onion slices

Temperature °C	Sulphitation level (%)	Drying time Minute	Final moisture content (Wb%)	Drying ratio	Rehydration ratio
50	0.00	540	5.89	7.71	5.01
	0.20	480	5.76	7.91	5.07
	0.30	480	5.55	7.93	5.10
	0.40	480	5.25	8.04	5.09
60	0.00	390	5.79	7.72	4.97
	0.20	360	6.60	7.84	5.09
	0.30	360	5.55	8.02	5.12
	0.40	360	5.07	8.03	5.13
70	0.00	330	5.77	7.74	4.95
	0.20	300	6.20	7.87	5.07
	0.30	300	5.70	7.94	5.13
	0.40	300	5.17	8.02	5.15

Table 3. Chemical composition of dehydrated white onion flakes

Temperature °C	Sulphitation level (%)	Ascorbic Acid mg/100g	Total sugar (%)	Non-enzymatic browning (O.D.)
50	0.00	4.15	5.10	143
	0.20	6.31	4.98	77
	0.30	6.79	4.92	49
	0.40	6.86	4.86	50
60	0.00	4.19	5.08	167
	0.20	6.28	4.10	89
	0.30	6.76	4.91	45
	0.40	6.80	4.85	46
70	0.00	4.10	5.06	224
	0.20	6.16	4.97	198
	0.30	6.28	4.91	172
	0.40	6.30	4.93	175
CD (5%)	0.015	0.014	0.7	

Pre-treatments

Onions with uniform size were selected for the experimental studies. After peeling and trimming, the onion bulbs were sliced at right angles to the vertical axis with a sharp stainless steel knife, to obtain slices of 4-5 mm thickness. Potassium metabisulphite (KMS) was adopted as a pretreatment for onion slices in order to prevent discoloration. Onion slices were soaked in 0.2, 0.3, 0.4 per cent KMS solution for 5 minutes (Pawar *et al.* 1988).

Dehydration

Each level of sulphited samples and control sample were spread uniformly at the rate of 2 kg in the perforated trays of size 90 x 40 cm, dried in cross flow drier at 50°, 60° and 70°C respectively. The loss in weight by the slices was determined at hourly interval. Drying was terminated when the sample attained the weight corresponding to 5-7 per cent moisture content. Onion slices were dried for about 5-8 hours depending upon the selected temperatures. Drying

Table 4. Chemical composition of dehydrated white onion flakes during storage

Storage days	Storage methods	Final Moisture content (Wb%)	Ascorbic acid (L) mg/100g	Total sugar (%)	Non-enzymatic browning (O.D.)	Rehydration ratio
30	C	5.62	6.74	4.95	47.50	5.10
	V	....	6.75	4.95	46.00	5.11
	N	5.59	6.75	4.94	47.00	5.11
60	C	5.71	6.40	4.97	50.00	5.08
	V	5.68	6.49	4.49	48.00	5.08
	N	5.70	6.45	4.96	47.00	5.08
90	C	5.85	6.09	5.11	52.20	5.04
	V	5.83	6.12	5.00	50.00	5.06
	N	5.84	6.11	5.02	51.50	5.05
	CD (5%)		0.006	0.004	0.9	

C : Control Storage ; V : Vacuum Storage ; N : Nitrogen filled bag storage.

ratio was recorded as the dried weight of the product to the weight before drying of the material.

Rehydration

Dehydrated products were rehydrated by steeping in distilled water for four hours. The dehydration ratio was computed as weight of the rehydrated sample to that of dehydrated samples as per ISI standard method.

Organoleptic evaluation

Organoleptic evaluation of dehydrated onion slices were performed to select the best sample among the dehydrated white coloured onion flakes in terms of colour, texture, pungency and overall acceptability by a panel of five judges in a nine point hedonic scale varying from like extremely to dislike extremely (Ranganna, 1979).

Packaging and storage studies

The best sample obtained by different treatments were packed in thick polyethylene bags and storage studies were carried out by adopting three methods of storage *viz.* vacuum storage, storage in polyethylene bags filled with nitrogen and control storage for a short period of three months. The biochemical changes were carried out at monthly interval.

Results and Discussion

Physio-Chemical Characteristics

The physio-chemical characteristics of the white onion used for dehydration studies are presented in Table. 1

The size of the variety under the study was of desirable limits for processing as in practice. Onions with more than 5 cm diameter are considered suitable for processing (Sethi *et al.* 1973). These values in the present study are broadly comparable with the. corresponding values reported by Kalra (1987).

Data on Dehydration

On an average 5 to 7 slices were recovered for dehydration. The peeling and trimming losses were 3.12 and 20.19 percent respectively. The dehydration characteristics of onion presented in Table. 2. Sulphitation with varying level of potassium metabi-sulphite (KMS) gave the product with varying characteristics at different drying temperatures. The sulphited samples required less time than the controls in all the temperatures. This might be due to the inducing action of sulphitation. The product attained the required final moisture level of 5 to 7 percent at 8,6,5 hours respectively at the temperatures *viz.* 50°, 60° and 70°C.

The drying ratio ranged from 7.71 to 8.04. The rehydration ratio of dehydrated white onion ranged from 4.95 to 5.15.

Sensory evaluation of reconstituted onion slices

The analysis of variance based on organoleptic scores of dehydrated onion flakes showed that the factors selected were adequate and suitable for consumption. From the organoleptic studies it was found that the onion slices, dehydrated at 60°C with 0.3 percent KMS scored the

maximum points. Hence these samples were used for storage studies. Biochemical analysis was also carried out for the dehydrated samples and the values are presented in Table. 3.

The ascorbic acid retention was comparatively higher at 50°C with 0.4 per cent KMS level. The sugar content was significantly higher at 50°C - control and the non-enzymatic browning was significantly minimum at 60°C -0.3 percent KMS level which showed that the sulphitation of onion flakes helped in retention of ascorbic acid and its natural colour. At the same time the sugar content was slightly reduced due to sulphitation.

From the packaging and storage studies (Table 4), it is observed that a progressive increase in moisture content from 5.55 to 5.85% (b) and reduced in ascorbic acid content (mg/100g) from 6.76 to 6.12. But these changes are comparatively lesser in vacuum storage method.

It is concluded that the browning was significantly lesser in the onion slices dehydrated at 60°C with 0.3 per cent KMS level. The optimum influence of temperature and pre-treatment level to control browning and preservation was at 60°C with 0.3 per cent KMS level. The dehydrated onion flakes could be preserved in thick vacuum packs for consumption.

References

Kalra, C.L. (1987). Harvesting, handling, storage, chemistry and technology of Onion : A resume *Ind. fd. Pack.* **41**:17-25

Osborne and Voogt. (1978). The Analysis of Nutrient in Foods. Academic Press, New York.

Pawar, V.N., Singh, I.N., Dev, D.N,., Kulkarni, D.N. and Ingle, V.M. (1988). Solar drying of white onion flakes. *Ind. Fd. Pack.* **42**: 14-28.

Ranganna, S. 1979. Manual of Analysis of Fruits and Vegetable Products. Tata McGraw-Hill Publishing Company Ltd., New Delhi.

Sadasivam, S. and Manickam,A. 1990. Biochemical Methods for Agri Sciences, Wiley Eastern Ltd., New Delhi.

Sethi, V., Anand, I.C. and Bhagahandi, P.M. 1973. Quality screening of white onion cultivars for use in dehydration. *Ind. Fd. Pack.* **27** : 2-8.

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Evaluation of coated DAP and nimin coated urea on available P status of wetland rice soil

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Abstract : To evaluate the efficiency of coated DAP in rice variety ADT 36 (Short duration: 105-110 days in *Kuruvai* season) and Nimin coated urea in rice variety IR 20 (Medium duration: 130-135 days in late samba season), two field experiments were conducted on a low P available loamy sand soil (Udic Ustropept) at Agricultural Research Station, Bhavanisagar during the period 1997-98. Phosphorus was applied at levels 100, 80 and 60 per cent of recommended P as coated and uncoated DAP and recommended dose of N was coated with Nimin. The treatments receiving coated DAP in first experiment, coated DAP along with Nimin coated urea in second experiment recorded the higher availability of P than uncoated fertilizers. *(Key words: Coated DAP, Uncoated DAP, Nimin coated urea, Available P)*