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EFFECT OF PRE-TREATMENTS ON CHEMICAL AND SENSORY QUALITIES OF DEHYDRATED RED ONION SLICES

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ABSTRACT
An investigation was conducted to study the effect of pre-treatments on chemical and sensory qualities of dehydrated red onion slices. Results indicated that, the ascorbic acid content of the dehydrated red onion slices was found maximum (11.33 mg/100 g) in the samples pre-treated with 0.5 per cent KMS at 3 month after storage (MAS). The maximum reducing sugar (14.70%) and total sugar (25.65%) retention of dehydrated red onion slices were found in the samples pre-treated with 0.5 per cent sodium metabisulphite + 0.5 per cent citric acid at 3 MAS. With regards to organoleptic characters, the maximum score for colour and appearance (4.05), taste and flavour (4.12) and overall acceptability (4.15) were recorded in the slices pre-treated with 0.5 per cent sodium metabisulphite + 0.5 per cent citric acid, respectively. However, the lowest ascorbic acid (8.97 mg/100g), reducing sugar (11.33%) and total sugar (19.90%) content were noticed in control at 3 MAS. The lowest mean scores were recorded for colour and appearance (2.71)in the sample pretreated with 0.5 per cent KMS. Whereas, the lowest mean scores were recorded for taste and flavour (2.75) and overall acceptability (2.85) in control at 3 MAS. The onion slices pre-treated with 0.5 per cent sodium metabisulphite + 0.5 per cent citric acid had recorded the better results for the chemical characters and organoleptic traits.

INTRODUCTION

Onion (*Allium cepa* L.) is one of the most important commercial vegetable cum spice crops grown in India. It is very important ingredient in cooking. Hence, it's called the Queen of kitchen. Onion is used in the fresh as well as processed form *viz.* dehydrated flakes, powder, pickles etc. Onion has a paramount effect in preventing heart diseases and other ailments (Kanwar *et al.*, 2013).A distinct characteristic of onion is its alliaceous odor, which accounts for their use as food. The pungency in onion is due to a volatile compound known as allyl-propyl disulphide (De *et al.*, 2013). In India onion is cultivated in an area of 10.52 lakh hectares with a production of 168.13 lakh tonnes, which accounts for 24.4 per cent of world's onion area and 20.1 per cent of world's onion production (Anon, 2013). The post harvest loss in onion is because of physiological loss in weight, sprouting and rotting during storage and handling. Freshly harvested onions contain about 80-85 per cent moisture and are highly prone for post harvest losses to the tune of 16-35 per cent of the annual production in India Rathod (2013).

Due to its perishability, proper storage is necessary to preserve the onion either in fresh or in processed form. However the efforts on dehydration of red onions are limited on commercial scale. The pre-treatments given to the vegetables before drying are also known to greatly influence the quality and yield of the dried product. Pre-treatments are necessary before drying in order to check the undesirable chemical and other qualitative changes that occur during the drying process and storage. Therefore, there is a need to develop complete protocol for processing including standardization of suitable pretreatment for dehydration. In this view the current study was carried out to study the effect of on pretreatments on chemical and sensory qualities of dehydrated red onion slices.

MATERIALS AND METHODS

An investigation on Effect of pretreatments on chemical and sensory qualities of dehydrated red onion slices was carried out in the Department of Post Harvest Technology, Kittur Rani Channamma College of Horticulture Arabhavi, Belgaum District, Karnataka, during the year 2012-2013. The experiment was laid out in Completely Randomized Design (CRD) with 9 treatments and 3 replications.

Red onions of uniform size, shape and good quality were selected. 15kg onion bulbs were used in each treatment (5kg/ replication). The sliced onions were treated with potassium metabisulphite, sodiummetabisulphite alone and in combination with citric acid in different concentrations for 5 minutes (as given in the treatment details). After treatment the onion slices were placed in a single layer in stainless steel trays. The loaded trays were kept in electrical dryer at temperature of 55ºC. After completion of drying, dried onion slices were packed in airtight polythene bags of 400 gauges and stored at ambient storage conditions.

Treatment Details

T_1– 0.25% Potassium metabisulphite (KMS)

T_2- 0.50% Potassium metabisulphite (KMS)

T_3- 0.25% Sodium metabisulphite

T_4- 0.50 % Sodium metabisulphite

T_5- 0.25% Potassium metabisulphite (KMS) + 0.50% Citric acid

T_6- 0.50% Potassium metabisulphite (KMS) + 0.50% Citric acid

T_7- 0.25% Sodium metabisulphite + 0.50% Citric acid

T_8- 0.50 % Sodium metabisulphite + 0.50% Citric acid

T_9- Control (untreated)

Ascorbic acid content was determined by using 2, 6 – dichlorophenol indophenol dye titrimetrically as per the modified procedure of AOAC. Five ml of juice was taken and diluted to a known volume (100 ml) with four per cent oxalic acid and then filtered through muslin cloth to get clear juice. Whereas, in case of dehydrated slices, five grams of sample was macerated with four per cent oxalic acid and filtered through muslin cloth to get a clear aliquot. Five ml of aliquot was titrated against 2, 6-dichlorophenol indophenol dye till the pink end point which persisted for at least 15 seconds (TV_2). The result was expressed as milligrams of ascorbic acid per 100 g of sample(Anon., 1984).

$$\text{Ascorbic acid (mg/100 g)} = \frac{\text{Ascorbic acid content in standard (mg)}}{\text{ml of aliquot}} \times \frac{\text{Total sample volume}}{\text{Weight of sample}} \times \frac{TV_2}{TV_1} \times 100$$

The percentage of reducing sugar in the dried product was determined by Dinitro-salycilic acid (DNSA) method.A known volume of alcohol extract was taken and allowed to evaporate the alcohol completely by heating in boiling water bath. Clear solution was taken for estimation of reducing sugar by using DNSA by following above method and values are expressed in terms of percentage(Miller, 1972). The total sugar content in the product was estimated by the same method as in case of reducing sugar after inversion of the non-reducing sugar using dilute hydrochloric acid (Anon., 1984). The per cent non-reducing sugar was obtained by subtracting the value of reducing sugar from that of total sugar and then multiplied by the factor 0.95.

Non-reducing sugar (%) = [Total sugar – reducing sugar] x 0.95.

The organoleptic evaluationwas carried out by a panel of 10 semi trained judges including teachers and post-graduate students of Kittur Rani Channamma College of Horticulture Arabhavi.The score card was based on a five point hedonic scale and a detail of the scorecard was (5- Highly acceptable, 4- Acceptable, 3-Fairly acceptable, 2- Poorly acceptable, and 1- Not acceptable) Vie *et al.*, 1991.

RESULTS AND DISCUSSION

Ascorbic acid and reducing sugar content of the dehydrated red onion slices was found to show significant variations among the treatments (Table 1). Significantly maximum ascorbic acid content (13.00, 12.03, 11.70 and 11.33 mg/ 100 g) was recorded in the slices pretreated with 0.50 per cent KMS (T_2) which is on par with T_1 (12.00, 11.63, 10.99 and 10.43 mg/100g) However the lowest ascorbic acid content (10.30,9.98, 9.37 and 8.97mg/100g) was noticed in untreated control (T_9) at first, second and third MAS, respectively. The decline in ascorbic acid concentration during storage is due to thermal degradation due to dehydration process and subsequent oxidation during storage. There was maximum retention of ascorbic acid content in dehydrated onion rings which was pretreated with 0.50 per cent potassium metabisulphite (T_2) as compare to other treatments. It may be due to effective antioxidant property of potassium metabisulphite which helps to retain maximum ascorbic acid during storage. The results of the investigation corroborate with the findings reported by Kulkarni (2011) in onion.Significantly, higher reducing sugar content (13.10, 13.64, 14.17 and 14.70%) was observed in the slices pretreated with 0.50 per cent sodium metabisulphite + 0.50 per cent citric acid (T_8) whereas, lowest reducing sugar content (10.13, 10.40, 10.98 and 11.33%) was recorded in untreated control at initial, first, second and third MAS, respectively. The content of reducing sugarshows increasing trend with the storage period. This may be due to the inversion of non-reducing sugar to reducing sugar.

Non-reducing and total sugar content of the dehydrated red onion slices was found to show significant variations (Table-2). Significantly higher non-reducing sugar content (9.92, 9.82, 9.75 and 9.62%) was observed in the slices pretreated with

Table 1: Effect of pre-treatments on ascorbic acid content and reducing sugar of dehydrated red onion slices

Pretreatments	Ascorbic acid (mg/100g)				Reducing sugars (%)			
	Initial	MAS			Initial	MAS		
		1	2	3		1	2	3
T_1 - 0.25% KMS	12.00.	11.63	10.99	10.43	11.67	11.99	12.27	12.67
T_2 - 0.50% KMS	13.00	12.03	11.70	11.33	11.05	11.46	11.87	12.33
T_3 - 0.25% SM	11.29	10.89	10.20	9.67	11.93	12.29	12.50	12.93
T_4 - 0.50% SM	11.83	11.23	10.23	9.77	12.23	12.42	12.77	13.11
T_5 - 0.25% KMS+0.50% CA	11.80	11.03	10.23	9.80	11.23	11.60	11.93	12.37
T_6 - 0.50% KMS+0.50% CA	11.00	10.67	10.17	9.77	11.67	11.93	12.30	12.72
T_7 - 0.25% SM+0.50% CA	10.99	10.32	9.78	9.17	12.07	12.33	12.63	13.00
T_8 - 0.50% SM+0.50% CA	11.33	10.53	9.80	9.33	13.10	13.64	14.17	14.70
T_9– Control	10.30	9.98	9.37	8.97	10.13	10.40	10.98	11.33
S.Em ±	0.28	0.18	0.35	0.23	0.20	0.30	0.34	0.35
C.D. at 1%	1.16	0.71	1.41	0.92	0.83	1.21	1.39	1.43

KMS - Potassium metabisulphite; SM - Sodium metabisulphite.CA - Citric acid.MAS- Months after storage

Table 2: Effect of pre-treatments on non-reducing and total sugarof dehydrated red onion slices

Pretreatments	Non-reducing sugars (%)				Total sugars (%)			
	Initial	MAS			Initial	MAS		
		1	2	3		1	2	3
T_1 - 0.25% KMS	8.05	8.01	7.96	7.92	20.14	20.43	20.65	21.00
T_2 - 0.50% KMS	9.01	8.91	8.74	8.62	20.53	20.83	21.07	21.40
T_3 - 0.25% SM	9.23	9.14	9.12	9.00	21.67	21.91	22.10	22.50
T_4 - 0.50% SM	9.67	9.58	9.53	9.42	22.40	22.50	22.81	23.03
T_5 - 0.25%KMS+0.50% CA	9.92	9.82	9.75	9.62	21.67	21.93	22.20	22.50
T_6 - 0.50% KMS+0.50% CA	9.53	9.45	9.40	9.35	21.70	21.87	22.20	22.57
T_7 - 0.25% SM+0.50% CA	9.62	9.59	9.58	9.50	22.20	22.42	22.72	23.00
T_8 - 0.50% SM+0.50% CA	9.79	9.58	9.50	9.46	23.40	23.73	24.17	25.65
T_9– Control	8.53	8.40	8.30	8.15	19.10	19.25	19.76	19.90
S.Em ±	0.01	0.03	0.02	0.02	0.27	0.26	0.27	0.17
C.D. at 1%	0.04	0.12	0.08	0.08	1.11	1.06	1.08	0.70

KMS - Potassium metabisulphite; SM - Sodium metabisulphite.CA - Citric acid.MAS- Months after storage

Table 3: Effect of pre-treatments on organoleptic evaluation (Score out of 5.00) of dehydrated red onion slices.

Pretreatments	Colour and appearance				Texture				Taste and flavour				Overall acceptability			
	Initial	MAS			Initial	MAS			Initial	MAS			Initial	MAS		
		1	2	3		1	2	3		1	2	3		1	2	3
T_1 - 0.25% KMS	3.55	3.40	3.25	3.00	3.35	3.18	3.10	3.02	3.85	3.30	3.10	3.00	3.75	3.55	3.20	3.00
T_2 - 0.50% KMS	3.20	3.00	2.90	2.71	3.25	3.15	3.00	2.90	4.00	3.40	3.25	3.10	3.60	3.48	3.20	2.92
T_3 - 0.25% SM	4.00	3.85	3.60	3.40	3.70	3.50	3.35	3.20	4.10	3.95	3.80	3.70	4.00	3.73	3.55	3.40
T_4 - 0.50% SM	4.20	4.00	3.85	3.70	4.00	3.85	3.62	3.41	4.24	4.10	4.05	3.90	4.15	4.00	3.82	3.52
T_5 - 0.25%KMS+0.50% CA	4.10	4.00	3.80	3.65	4.05	3.90	3.75	3.55	4.38	4.15	4.04	3.89	4.20	4.12	3.90	3.78
T_6-0.50% KMS+0.50% CA	4.18	4.10	4.00	3.85	4.15	3.95	3.80	3.66	4.40	4.19	4.07	3.95	4.35	3.15	4.05	3.95
T_7 - 0.25% SM+0.50% CA	4.40	4.30	4.15	4.00	4.60	4.47	4.30	4.10	4.60	4.40	4.22	4.05	4.52	4.38	4.20	4.00
T_8 - 0.50% SM+0.50% CA	4.50	4.32	4.20	4.05	4.55	4.35	4.24	4.06	4.76	4.50	4.35	4.12	4.62	4.47	4.30	4.15
T_9 - Control	3.50	3.30	3.10	3.00	3.50	3.25	3.05	3.00	3.15	3.00	2.90	2.75	3.50	3.25	3.05	2.85

KMS - Potassium metabisulphite; SM - Sodium metabisulphite.CA - Citric acid. MAS- Months after storage

0.25 per cent KMS + 0.50 per cent citric acid (T_5) whereas, lowest non-reducing sugar content (8.05, 8.01, 7.96, 7.92%) was recorded in the slices pretreated with 0.25 per cent KMS (T_1) at initial, first, second and third month after storage, respectively.The highest total sugar content (23.40%) was recorded in the slices pretreated with 0.50 per cent sodium metabisulphite + 0.50 per cent citric acid (T_8) which is on far with T_4 (22.40%), whereas, lowest (19.10%) were found in untreated control (T_9) at initial period.During storage period, higher total sugar content (23.73, 24.17 and 25.65%) was recorded in the slices pretreated with 0.50 per cent sodium metabisulphite + 0.50 per cent citric acid (T_8) at first, second and third month after storage, respectively.Whereas, lowest total sugar content (19.25, 19.76 and 19.90%) was observed in untreated control (T_9) at first, second and third month after storage, respectively. It is due to removal of moisture which leads to increase in concentration of sugar. The increased total sugar with the storage period,attributed to hydrolysis of polysaccharides resulting in production of soluble compounds like sugar. These observations are in line with that reported by Ajaykumar *et al.* (2012) in green chilli powder and Rathod (2013) in onion.

With regards to sensory evaluation of product is the first step to know the consumer acceptability. In the present investigation dehydrated red onion slicesrevealed differences with respect to colour and appearance, texture, taste and f lavour and overall acceptability due to different pretreatments (Table 3). Highest scores for colour and appearance (4.50, 4.32, 4.20 and 4.05) were recorded in the slices pretreated with 0.50 per cent sodium metabisulphite + 0.50 per cent citric acid (T_8) whereas, lowest scores for colour and appearance (3.20, 3.00, 2.90 and 2.71) were recorded in the slices pretreated with 0.50 per cent KMS (T_2) in initial, first, second and third month after storage, respectively.The highest scores for texture (4.60, 4.47, 4.30 and 4.10)was observed in the slices pretreated with 0.25 per cent sodium metabisulphite + 0.50 per cent citric acid (T_7) whereas, lowest scores (3.25, 3.15, 3.00 and 2.90) were observed in the slices pretreated with 0.50 per cent KMS (T_2)at first, second and third month after storage, respectively.The highest scores for taste and flavour (4.76, 4.50, 4.35 and 4.12)and overall acceptability (4.62, 4.47, 4.30 and 4.15) were noticed in the slices pretreated with 0.50 per cent sodium metabisulphite + 0.50 per cent citric acid (T_8) whereas, least score for taste and flavour (3.15, 3.00, 2.90 and 2.75) and overall acceptability (3.50, 3.25, 3.05 and 2.85) was noticed in untreated control (T_9) at initial period, first, second and third MAS, respectively.This may be attributed to the beneficial effects of combination of sodium metabisulphiteand citric acid on the above mentioned parameters than alone (Debnath *et al.,* 2004). Because, these combination helps to inhibit non-enzymatic reaction. Therefore, maintains the colour and appearance, texture and thereby maximum score for overall acceptability. However, untreated control (T_9) showed least score with respect to organoleptic parameter and physico-

chemical properties as compared to the pre-treated samples. Thus, the pre-treatments helped in retaining better organoleptic quality parameters during storage. Similar results were also reported by Devraj (2000) and Rathod (2013) in onion.

REFERENCES

Ajaykumar, M. T., Jadhav, S. L. and Bhotmange, M. G. 2012. Effect of pretreatments on quality attributes of dried green chilli powder. ISCA *J. Engineering Sci.* **1(1):** 71-74.

Anonymous 1984. Official Methods of Analysis. *ED. Sioney Williums. Association official*

Anonymous 2013. Indian horticulture data base, http//www. *nhbdatabase. gov.in*

De, S., Manna, D., Sarkar, A. and Maity, T. K. 2013. Influence of biozyme on growth, yield and quality of onion (Allium cepa L.) cv. Sukhsagar . *The Bioscan*. **8(1):** 1271-1273.

Debnath, S., Hemavathy, J., Bhat, K. K. and Rastogi, N. K. 2004. Rehydration characteristics of osmotic pre-treated dehydrated onion. *Food and Bio products Processing*. **82:** 304-310.

Devraj 2000. Dehydration studies in red onion. *M. Sc. (Hort.) Thesis, Univ. Agric. Sci., Bangalore, India*.

Kanwar, M. S. and Ishfaq, A. 2013. Effect of planting methods on performance of onion varieties under cold desert conditions.*The Bioscan*. **8(1):** 911-913.

Kulkarni, A. T. 2011. Standardisation of pre-treatments and drying methods in dehydration of onion. M. Sc. (Hort.) Thesis, *Univ. Horti. Sci.*, Bagalkot, India.

Miller, G. L. 1972. Use of dinitro salicylic acid reagent for determination of reducing sugar. *Annual Chemistry*. **31:** 426-428.

Rathod, A. C. 2013. Effect of pretreatment and drying methods in dehydration of onion. M.Sc.(Hort.) Thesis, *Univ. Horti. Sci.*, Bagalkot, Karnataka, India.

Vie, A., Gulli, D. and Mahony, M.1991. Alternative Hedonic measure. *J. Food Sci*. **56:** 1-5.