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EFFECT OF HUMECTANTS ON STORAGE STABILITY OF INTERMEDIATE MOISTURE BEETROOT CUBES

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ABSTRACT

Intermediate moisture beetroot cubes were prepared by soaking the beetroot cubes in the soaking solution containing sugar: glycerol/sorbitol in different ratios. The processed product was stored at ambient conditions and subjected to chemical and sensory evaluations at an interval of one month for a period of three months. Significantly higher value of reducing sugar, total sugars and titratable acidity (2.71, 28.30 and 0.10%, respectively) were recorded in treatment T_1(Sugar: glycerol::100:00). Significantly lower values of reducing sugar (1.88%) in T_7(Sugar: glycerol::40:60), total sugar (23.34%) in T_{13}(Sugar: Sorbitol::40:60) and titratable acidity (0.05%) in T_{13}(Sugar: Sorbitol::40:60) were recorded. The statistically higher value of moisture content (27.14%) was recorded in treatment T_7(Sugar: Glycerol::40:60), where as the lowest value (23.12%) observed in T_1(Sugar: Glycerol::100:00). The highest pH (7.25) was recorded in T_{13} (Sugar: Sorbitol: 40:60) and lowest (6.98) was recorded in T_1(Sugar: Glycerol::100:00).However, with the advancement of storage periods, an increasing trend was observed in total and reducing sugars. The decreasing trend was observed in moisture, pH and ascorbic acid during the three months of storage. The intermediate moisture beetroot cubes prepared from treatment T_6 (Sugar: Glycerol::50:50)was adjudged to be the best on the basis of sensory attributes by scoring 7.05 7.80, 7.80 and 7.70 for colour, taste, texture and flavour, respectively followed by treatment T_1(Sugar: Glycerol::100:00).
***Keywords*:** Beetroot, intermediate moisture, storage, humectants

Introduction

Beetroot (*Beta vulgaris* L.), a herbaceous biennial of Chenopodiaceae family has several varieties with bulb colours ranging from yellow to red. Beetroot grows plentiful throughout India from the hills of South India to the hilly areas of North India. Beet root is mainly cultivated in the states like Haryana, Uttar Pradesh, Himachal Pradesh, West Bengal and Maharashtra. Deep red-coloured beet roots are the most popular for human consumption, both cooked and raw as *salad* or juice. The purple-red colour is due to the presence of betalin pigment. Betanins, obtained from the roots, are used industrially as red food colourants, *e.g.* to improve the colour of tomato paste, sauces, desserts, jams, jellies, ice creams, sweets and cereals. Consumption of red beet which is rich source of antioxidants can contribute to protection from age related diseases. Therefore, there is a need of proper processing and preservation technique so as to get the maximum benefits from beetroot.

Intermediate moisture foods (IMFs) can be classified as partially dehydrated foods with suitable concentrations of dissolved solids to inhibit the growth of bacteria, moulds, and yeasts and to control undesirable enzymatic activity. The IMFs are semi-moist foods that have some of their water bound by sucrose, glycerol, sorbitol, salt or certain organic acids for a short period of time, thus, preventing the growth of many microorganisms (Panwar *et al*., 2013). The intermediate moisture foods have an acceptable eating quality *i.e.*, better colour, texture and flavour as compared to conventional hot air dried foods and have reasonable storage stability under ambient conditions (Iman *et al*., 2011). Keeping in view the commercial potential of IMF, the present study has been undertaken for preparation of intermediate moisture beetroot cubes.

Materials and Methods

Medium sized beetroot fruits of good quality were purchased from Narwal Mandi, Jammu and transported to Division of FST, SKUAST-J for further processing. Fresh beetroots were washed, cleaned, peeled and cut into cubes of 1×1×1cm. The cubes were blanched and soaked for 12-16 h in the soaking solution and kept in the refrigerator (4^0C). The soaking solution was prepared by dissolving glycerol/ sorbitol, sugar, water, potassium sorbate and sodium benzoate in different proportions as per treatment ratios (Table 1). Permissible additives such as sugar, glycerol and sorbitol as humectants, potassium sorbate as fungistat and sodium benzoate as preservative were mixed in the soaking solution for increasing the concentration and lowering the water activity (a_w) values. The soaking solution was drained from the beetroot cubes which were then dried at 60-65^{0}C in cabinet drier for 2 h. The processed product was packed in air tight polythene jars and stored at room temperature for 3 months and were analyzed at an interval of one month.

The moisture content, titratable acidity and ascorbic acid was determined on the basis of (AOAC, 2005) method.

The pH was estimated with the help of Elico pH-meter. Sugars were estimated by Lane and Eynon method as detailed by Ranganna (1986). The acceptability of the product was evaluated in terms of colour, texture, flavour and taste by a panel of judges. The results obtained were statistically analyzed using factorial completely randomized design for interpretation of results through analysis of variance (Gomez and Gomez, 1984).

Table 1: Treatments for preparation of Intermediate Moisture Beetroot cubes

Treatments	Sugar (%)	Glycerol (%)	Sorbitol %)
T_1	100	00	
T_2	90	10	
T_3	80	20	
T_4	70	30	
T_5	60	40	
T_6	50	50	
T_7	40	60	
T_8	90		10
T_9	80		20
T_{10}	70		30
T_{11}	60		40
T_{12}	50		50
T_{13}	40		60

Results and Discussion

Moisture Content

A significant decrease in moisture content of IMFs of sugarbeet in different treatments was observed during the various storage periods (Table 2). At the beginning of the storage period (0 day), the statistical higher moisture content (28.28%) was recorded in treatment T_7 (Sugar: glycerol::40:60), however, the lowest moisture content (26.04%) recorded in T_1 (Sugar:glycerol::100:00). At the later days of storage (90 days), the significantly higher moisture content (27.14%) was again recorded in treatment T_7, which was followed by T_6 (Sugar:glycerol::50:50), where as treatment T_1recorded significantly lower value (23.12%) of moisture content. The mean values of storage period showed a significant decrease from initial value of 27.07 to 25.63%during 90 days of storage. Panwar *et al.* (2013) observed a decrease in moisture content of intermediate moisture aonla segments.

Titratable acidity

There was a slight increase in titratable acidity upto 90 days of storage in all treatment combinations; however, the difference was non significant (Table 2). The maximum titratable acidity was 0.09% in treatment T_1 and minimum of 0.04% in treatment T_{13} (Sugar:sorbitol::40:60). After 90 days of storage, significantly higher titratable acidity (0.10%) observed in treatment $T_1$and the lowest of 0.05% in T_{13}. The mean value of storage period showed an increase from initial value of 0.06 to 0.07% from 0-90 days of storage. The increase in titratable acidity might be due to loss of moisture during storage period. Increase in acidity can also be attributed to the degradation of cell wall components to produce organic acids. Akhtar and Javed (2013) reported an increase in acidity of intermediate moisture apple slices during two months of storage.

pH

Different treatment combinations of IMFs of beetroot cubes were significantly influenced by various storage periods for pH values (Table 2). At initial day of storage (0 day), significantly higher (7.35) vale of pH was recorded in treatment $T_{13}$and the treatment T_1recorded the lowest value (7.12). In general, pH of IMFs of beetroots slightly decreased with the advancement of storage period. After 90 days of storage, the treatment T_{13} registered the significantly higher value (7.25) of pH; whereas minimum value (6.98)was recorded with treatment T_1. The mean value of pH decreased from 7.28 at initial day of storage to 7.07 after 90 days of storage. The decrease in pH might be due to the breakdown of ascorbic acid into dehydro ascorbic acid. Similar finding have been reported by Sood (2000) in intermediate moisture papaya cubes, apple slices, and white guard cubes.

Total sugar

Total sugar content of intermediate moisture beetroots cubes under different treatment combinations showed a significant increase during various storage periods (Table 3). At initial day, treatment T_1 registered statistically higher value (27.65%) of total sugar, followed by treatment T_2 having the value (26.18%). At 90 days of storage period, again treatment T_1 recorded significantly higher value (28.30%) followed by treatment T_2 with total sugar content of 27.32%. The treatment T_3 recorded significantly lower values of total sugars in all the storage periods from 0 to 90 days. The mean values of total sugars showed an increase from initial value of 24.28 to 25.69% during 90 days of storage. The increase in total sugars content during the different storage periods could be due to hydrolysis of polysaccharides and inversion of non-reducing sugars. Barmanray (1998) observed an increase in total sugars of intermediate moisture pear during 90 days of storage.

Reducing sugar

Different treatment combinations significantly influenced the reducing sugar content of intermediate moisture beetroot cubes during various storage periods (Table 3). Among the different treatments, T_1recorded significantly higher value (2.28%) of reducing sugars which was immediately followed by significantly lower value (2.06%) in treatment T_2 at initial day of storage. Again at 90 days of storage, treatment T_1 recorded statistically higher

value (2.71%) of reducing sugar content which was followed by T_2having the value 2.41%. Significantly lower (2.04%) was recorded in treatment T_{13} at 90 days of storage. In general, there was a significant increase in reducing sugar content with the progress in storage period. The mean values of storage period showed an increase from initial value of 1.84 to 2.30% at 90 days of storage. The increase in reducing sugar content during various storage periods might be due to the inversion of non-reducing sugars into reducing sugars. Muzzaffar *et al.* (2016) observed that the reducing sugars increased significantly during three months of storage in pumpkin candy.

Ascorbic acid

Effect of various treatments during different storage periods on ascorbic acid content of intermediate moisture beetroot cubes was significant (Table 3). At initial day of storage (0 day), significantly higher ascorbic acid content (4.40 mg/100 g) was recorded in treatment $T_1$and the lowest value of 3.61 mg/100 g observed in T_{13}. After 90 days of storage, significantly higher ascorbic content (3.80 mg/100 g) was observed in treatment T_6 and T_8 recorded the significantly lower value (3.06 mg/100 g). Over all highest mean ascorbic acid content (3.95 mg/100 g) was recorded in T_6 and the lowest (3.51 mg/100 g)observed in treatment T_{13}. Mean values during 90 days storage period decreased from 4.06 to 3.43 mg/100 g. Reduction in ascorbic acid could be due to the oxidation by oxygen which resulted in the formation of dehydro ascorbic acid. Similar observations were reported by Gupta and Kaul (2013) in ber chuhara.

Colour

Colour score of intermediate moisture beetroot cubes decreased significantly during entire storage period (Table 4). At initial day, statistically higher colour score of 7.60 was observed in treatment T_7followed by value 7.50 and in treatmentT_6. However, the minimum value of colour (6.22) was recorded in treatment T_8. After 90 days of storage period, colour score decreased to 7.10 and 7.05 from 7.60 and 7.50 in treatments T_7 and T_6, respectively. The highest overall mean colour score of 7.35 was recorded in T_7 followed by treatment T_6 having the value 7.27. During the various storage periods, there was significant decrease in the mean score from 6.97 at initial day to 6.49 during 90 days of storage period. The decrease in colour scores during storage may be attributed to residual activities of polyphenolase and oxidative type of deterioration resulting from chemical reactions. Similar findings have also been observed by Manhoori *et al.* (2020) in litchi-beetroot blended leather..

Texture

Different treatment combinations and storage periods had statistically significant effect on texture of intermediate moisture beetroot cubes (Table 4). Statistically score of 7.90 recorded in treatment T_6 which was followed by the value of texture (7.80) in treatment T_1 at 0 day of storage. At 90 days of storage period, significantly higher score of texture (7.80) was observed in treatment T_6followed by 7.70 value in treatment T_1. Mean value of treatments varied significantly and the highest mean score of texture (7.85) was registered in treatment $T_6$and treatment T_8 recorded the lowest value (6.06). During the various storage periods, there was a significant decrease in the mean score of texture from 7.06 at initial day to 6.74 during 90 days of storage period. It might be due to enzymatic breakdown of middle lamella and cell wall by pectin methlesterase, polygalacturanase, ß-galactosidase and cellulose. Mondhe *et al.* (2013) also observed reduction of flavour in intermediate moisture papaya cubes.

Taste

The sensory scores for taste of intermediate moisture beetroot cubes showed a significant gradual decrease up to the end of 90 days storage period (Table 4). At the initial day, the statistically higher score (7.95) on taste of intermediate moisture beet roots was recorded in treatment T_6 followed by 7.90 value in treatment T_1. After 90 days of storage, the values decreased to 7.80 in T_6 and 7.70 in T_1 from the initial value of 7.95 and 7.90, respectively. The highest mean score of 7.87 was assigned to treatment T_6followed by 7.79 in T_1. During storage period, there was significant decrease in mean score from 7.32 to 6.98 after 90 days of storage period. Sood (2000) reported the decreasing trend of Taste score with increase in storage time of intermediate moisture papaya, apple and white guard cubes.

Flavour

At initial day of storage, significantly higher flavour score of 7.95was recorded in treatment T_6followed by T_1 with the value 7.90 (Table 5). After 90 days of storage, the values of flavour of intermediate moisture beet roots decreased to 7.70 and 7.50 in treatment $T_6$and treatment T_1 from the initial values of 7.95 and 7.90, respectively. During the various storage periods, there was significant decrease in mean score from 7.15 to 6.70 after 90 days of storage. The decrease in flavour of intermediate moisture beet roots during storage may be due to the volatile nature of flavouring components and the chemical interactions which may have taken among the various constituents. Pooja (1999) reported loss of flavour in intermediate moisture food of apricots during 90 days of storage.

Conclusion

On the basis of sensory evaluation (color, taste, texture and flavour) treatment T_6(Sugar:Glycerol::50:50)was found to be the best treatment followed by treatment T_1(Sugar:Glycerol::100:00). It can be safely presumed that in future, the food industry shall give due consideration to the intermediate moisture foods, which not only add new dimension to our dietary habits but also retain the nutritive and quality parameters very close to the natural counterparts.

Conflicts of Interest

The author claims no conflicts of interest to conduct this research work.

Table 2 : Effect of treatments and storage periods on moisture content (%), titrable acidity (%) and pH of intermediate moisture beetroot cubes.

Treatments	Moisture content (%)					Titratable acidity (%)					pH				
	Storage period (days)					Storage period (days)					Storage period (days)				
	0	30	60	90	Mean	0	30	60	90	Mean	0	30	60	90	Mean
T_1(Sugar:Glycerol::100:00)	26.04	25.55	24.32	23.12	24.76	0.09	0.09	0.09	0.10	0.09	7.12	7.09	7.04	6.98	7.05
T_2 (Sugar:Glycerol::90:10)	26.18	26.02	25.30	24.26	25.44	0.07	0.07	0.08	0.09	0.08	7.18	7.14	7.09	7.02	7.10
T_3 (Sugar:Glycerol::80:20)	27.32	26.91	26.18	25.80	26.55	0.07	0.07	0.08	0.09	0.08	7.22	7.20	7.15	7.11	7.17
T_4 (Sugar:Glycerol::70:30)	27.66	27.24	26.82	26.18	26.97	0.06	0.07	0.08	0.08	0.08	7.26	7.24	7.19	7.16	7.21
T_5 (Sugar:Glycerol::60:40)	27.97	27.29	26.96	26.75	27.24	0.06	0.07	0.08	0.08	0.07	7.31	7.26	7.22	7.18	7.24
T_6 (Sugar:Glycerol::50:50)	28.20	27.86	27.44	27.08	27.64	0.05	0.06	0.06	0.07	0.06	7.32	7.29	7.25	7.22	7.27
T_7 (Sugar:Glycerol::40:60)	28.28	28.03	27.85	27.14	27.82	0.05	0.06	0.07	0.08	0.06	7.33	7.30	7.26	7.24	7.28
T_8 (Sugar:Sorbitol::90:10)	26.15	25.83	25.20	24.31	25.37	0.06	0.06	0.06	0.06	0.06	7.31	7.26	7.18	7.14	7.22
T_9 (Sugar:Sorbitol::80:20)	26.60	25.86	25.31	25.10	25.72	0.05	0.05	0.06	0.06	0.05	7.31	7.26	7.19	7.14	7.22
T_{10} (Sugar:Sorbitol::70:30)	27.07	26.40	25.85	25.52	26.21	0.05	0.05	0.06	0.07	0.06	7.32	7.27	7.19	7.15	7.22
T_{11} (Sugar:Sorbitol::60:40)	27.10	26.72	26.40	25.64	26.46	0.05	0.06	0.06	0.07	0.06	7.32	7.28	7.20	7.15	7.24
T_{12} (Sugar:Sorbitol::50:50)	27.16	26.85	26.66	26.09	26.69	0.04	0.05	0.05	0.06	0.05	7.33	7.28	7.22	7.16	7.25
T_{13} (Sugar:Sorbitol::40:60)	27.21	26.91	26.71	26.20	26.76	0.04	0.04	0.05	0.05	0.05	7.35	7.28	7.25	7.25	7.29
Mean	27.07	26.72	26.23	25.63		0.06	0.06	0.06	0.07		7.28	7.22	7.17	7.07	

Factors	Moisture content (%)	Titratable acidity (%)	pH
	CD (P=0.05)	CD (P=0.05)	CD (P=0.05)
Treatments	0.02	NS	0.01
Storage	0.01	0.01	0.01
Treatments x storage	0.03	NS	0.03

Table 3 : Effect of treatments and storage periods on total sugars (%), reducing sugars (%) and ascorbic acid (mg/100 g) of intermediate moisture beetroot cubes

Treatments	Total sugars (%)					Reducing sugars (%)					Ascorbic acid (mg/100 g)				
	Storage period (days)					Storage period (days)					Storage period (days)				
	0	30	60	90	Mean	0	30	60	90	Mean	0	30	60	90	Mean
T_1(Sugar:Glycerol::100:00)	27.65	27.82	27.98	28.30	27.93	2.28	2.35	2.54	2.71	2.47	4.40	4.21	3.78	3.32	3.93
T_2 (Sugar:Glycerol::90:10)	26.18	26.58	27.10	27.32	26.79	2.06	2.19	2.26	2.41	2.23	4.32	4.14	3.80	3.41	3.92
T_3 (Sugar:Glycerol::80:20)	25.75	26.15	26.56	27.04	26.37	1.95	2.18	2.24	2.36	2.18	4.29	4.11	3.82	3.46	3.92
T_4 (Sugar:Glycerol::70:30)	25.42	25.88	26.24	26.90	26.11	1.78	1.92	2.12	2.28	2.02	4.26	4.06	3.86	3.58	3.94
T_5 (Sugar:Glycerol::60:40)	24.91	25.36	25.86	26.51	25.66	1.66	1.80	1.93	2.15	1.88	4.12	4.02	3.90	3.77	3.95
T_6 (Sugar:Glycerol::50:50)	24.36	25.02	25.84	26.48	25.42	1.52	1.77	1.89	2.09	1.82	4.08	3.98	3.92	3.80	3.95
T_7 (Sugar:Glycerol::40:60)	23.90	24.22	24.91	25.31	24.58	1.47	1.60	1.62	1.88	1.64	3.95	3.92	3.89	3.76	3.88
T_8 (Sugar:Sorbitol::90:10)	24.81	24.98	25.26	25.46	25.12	2.12	2.26	2.48	2.64	2.38	4.10	3.82	3.51	3.06	3.62
T_9 (Sugar:Sorbitol::80:20)	23.96	24.41	24.98	25.28	24.65	2.03	2.21	2.35	2.55	2.28	4.06	3.81	3.53	3.12	3.63
T_{10} (Sugar:Sorbitol::70:30)	22.84	23.22	23.71	24.27	23.51	1.85	1.98	2.22	2.40	2.11	4.02	3.72	3.40	3.18	3.58
T_{11} (Sugar:Sorbitol::60:40)	22.33	22.84	23.41	23.90	23.12	1.81	1.90	2.06	2.24	2.00	3.93	3.72	3.41	3.36	3.60
T_{12} (Sugar:Sorbitol::50:50)	21.92	22.41	23.26	23.88	22.87	1.76	1.84	1.98	2.16	1.93	3.76	3.68	3.54	3.40	3.60
T_{13} (Sugar:Sorbitol::40:60)	21.68	22.28	22.76	23.34	22.66	1.62	1.75	1.90	2.04	1.83	3.61	3.56	3.52	3.37	3.51
Mean	24.28	24.70	25.22	25.69		1.84	1.98	2.12	2.30		4.06	3.98	3.68	3.43	

Factors	Total sugars (%)	Reducing sugars (%)	Ascorbic acid (mg/100 g)
	CD (P=0.05)	CD (P=0.05)	CD (P=0.05)
Treatments	0.02	0.02	0.02
Storage	0.01	0.01	0.01
Treatments x storage	0.04	0.04	0.04

Table 4 : Effect of treatments and storage periods on colour, texture and taste of intermediate moisture beetroot cubes

Treatments	Colour					Texture					Taste				
	Storage period (days)					Storage period (days)					Storage period (days)				
	0	30	60	90	Mean	0	30	60	90	Mean	0	30	60	90	Mean
T_1(Sugar:Glycerol::100:00)	7.50	7.40	7.24	7.00	7.28	7.80	7.76	7.74	7.70	7.75	7.90	7.80	7.76	7.70	7.79
T_2 (Sugar:Glycerol::90:10)	7.05	6.90	6.72	6.53	6.80	7.01	6.92	6.84	6.65	6.85	7.34	7.25	7.10	6.95	7.16
T_3 (Sugar:Glycerol::80:20)	7.15	7.00	6.86	6.68	6.92	7.06	6.90	6.78	6.71	6.86	7.72	7.50	7.48	7.34	7.51
T_4 (Sugar:Glycerol::70:30)	7.20	6.95	6.78	6.70	6.91	7.40	6.95	6.80	6.75	6.97	7.78	7.60	7.50	7.35	7.56
T_5 (Sugar:Glycerol::60:40)	7.25	7.06	6.80	6.75	6.96	7.52	7.30	7.25	7.10	7.29	7.80	7.65	7.54	7.40	7.60
T_6 (Sugar:Glycerol::50:50)	7.50	7.35	7.20	7.05	7.27	7.90	7.88	7.82	7.80	7.85	7.95	7.90	7.84	7.80	7.87
T_7 (Sugar:Glycerol::40:60)	7.60	7.40	7.30	7.00	7.32	7.70	7.65	7.60	7.55	7.62	7.85	7.84	7.60	7.50	7.70
T_8 (Sugar:Sorbitol::90:10)	6.22	6.05	5.88	5.78	5.98	6.30	6.12	6.04	5.80	6.06	6.40	6.35	6.20	6.00	6.24
T_9 (Sugar:Sorbitol::80:20)	6.50	6.32	6.20	6.10	6.28	6.32	6.30	6.25	6.10	6.24	6.67	6.50	6.40	6.35	6.28
T_{10} (Sugar:Sorbitol::70:30)	6.52	5.39	5.28	6.15	5.83	6.40	6.31	6.25	6.18	6.28	6.74	6.50	6.45	6.38	6.48
T_{11} (Sugar:Sorbitol::60:40)	6.66	6.50	6.30	6.18	6.41	6.46	6.28	6.25	6.20	6.30	6.79	6.60	6.50	6.40	6.57
T_{12} (Sugar:Sorbitol::50:50)	6.72	6.45	6.34	6.25	6.44	7.00	6.80	6.75	6.55	6.77	7.26	7.14	7.12	7.05	7.14
T_{13} (Sugar:Sorbitol::40:60)	6.70	6.40	6.30	6.20	6.40	7.00	6.75	6.62	6.50	6.72	7.00	6.80	6.65	6.60	6.76
Mean	6.97	6.70	6.55	6.49		7.06	6.91	6.84	6.74		7.32	7.18	7.08	6.98	

Factors	CD (P=0.05)	CD (P=0.05)	CD (P=0.05)
Treatments	0.02	0.02	0.02
Storage	0.01	0.01	0.01
Treatments x storage	0.03	0.03	0.03

Table 5 : Effect of treatments and storage periods on flavour of intermediate moisture beetroot cubes

Treatments	Storage period (days)				
	0	30	60	90	Mean
T_1 (Sugar:Glycerol::100:00)	7.90	7.88	7.65	7.50	7.76
T_2 (Sugar:Glycerol::90:10)	7.15	7.30	7.20	6.40	7.01
T_3 (Sugar:Glycerol::80:20)	7.50	7.40	7.25	7.10	7.31
T_4 (Sugar:Glycerol::70:30)	7.55	7.42	7.30	7.12	7.35
T_5 (Sugar:Glycerol::60:40)	7.61	7.50	7.30	7.15	7.39
T_6 (Sugar:Glycerol::50:50)	7.95	7.90	7.85	7.70	7.85
T_7 (Sugar:Glycerol::40:60)	7.80	7.60	7.55	7.40	7.59
T_8 (Sugar:Sorbitol::90:10)	6.22	6.05	5.90	5.80	5.99
T_9 (Sugar:Sorbitol::80:20)	6.40	6.20	6.16	6.00	6.19
T_{10} (Sugar:Sorbitol::70:30)	6.50	6.30	6.18	6.05	6.26
T_{11} (Sugar:Sorbitol::60:40)	6.59	6.40	6.20	6.10	6.32
T_{12} (Sugar:Sorbitol::50:50)	7.06	6.80	6.65	6.58	6.77
T_{13} (Sugar:Sorbitol::40:60)	6.82	6.60	6.40	6.30	6.53
Mean	7.15	7.02	6.89	6.70	

Factors	CD(P=0.05)
Treatments	0.02
Storage	0.01
Treatments x Storage	0.04

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