EFFECT OF STORAGE ON THE QUALITY OF VITAMIN C FORTIFIED DATE SYRUP

Riaz Ahmad Riaz, Tahir Zahoor & Mohammad Osman Abdullah
Department of Food Technology,
University of Agriculture, Faisalabad

Date is an important fruit of Pakistan. Good quality dates are consumed as such. On the other hand, second quality dates are virtually wasted. In this study, an effort was made to utilize inferior grade dates in preparation of vitamin C fortified syrup. For this purpose, sugar was extracted by cooking the dates with water and then concentrated to 70° Brix under vacuum in the presence of some clarifying agents. After adding vitamin C, the date syrup was hot filled into bottles, sealed with crown corks and stored at ambient temperature for three months. Freshly prepared date syrup contained 70% total soluble solids, 5.35 to 6.62 pH, 2.16 to 2.27% ash and 64 to 67 mg ascorbic acid. A substantial loss of ascorbic acid, a slight decrease in pH with a non-significant change in total soluble solids and ash in date syrup during storage was noticed. Organoleptically, the products compared well with pure honey and apple jam on breakfast bread toasts. It was concluded that inferior grade dates could be converted successfully into date syrup rich in vitamin C with a good storage stability.

INTRODUCTION

Date is the third major crop of Pakistan with 230.7 thousand tonnes per annum fruit production. The province-wise production of dates is 84.3 thousand tonnes for Balochistan, 72.9 thousand tonnes for Punjab, 66.1 thousand tonnes for Sindh and 7.4 thousand tonnes for N.W.F.P. (Anonymous, 1990).

This fruit is high in energy, good source of calcium and magnesium and a fair source of protein and vitamin A. The fruit is comparatively more suitable for persons suffering from general hypertension due to its low sodium and high potassium content (Anonymous, 1972).

Being highly perishable, a huge amount of this fruit is wasted in the glut season due to lack of facilities for its proper processing and preservation on scientific lines. Some attempts to use low quality fruits for preparation of date syrup were made by Barreveld (1971), Benjamin *et al.* (1975) and Ehrenberg (1977). Recently, Abdollah *et al.* (1988) produced an acceptable quality date syrup with good storage stability using some clarifying agents from inferior grade fruit. The present study was conducted to prepare a vitamin C fortified date syrup and to determine its quality during storage at ambient temperature.

MATERIALS AND METHODS

Second quality dates were purchased from the plantation and washed thoroughly with water. The fruit was cooked for 15 minutes in double-jacketted steam kettle after addition of three volumes of water. The stones and pith were separated by passing through coarse pulper. It was passed subsequently through filter press using coarse thick cloth.

The date extract was concentrated under vacuum to 70° Brix after addition of 0.1% either sodium hydrogen carbonate or sodium hydrosulphite. After an addition of 50 mg ascorbic acid 100 ml^{-1} to the date syrup, it was hot filled into pre-sterilized bottles, capped by machine with crown corks and stored for three months at ambient temperature ranging from 17-40°C.

The vitamin C fortified date syrup was analyzed for total soluble solids, pH, ash and ascorbic acid according to the methods described by Ruck (1969). Date syrup samples were also evaluated organoleptically using the scoring method of Krum (1955). The results were subjected to statistical analysis (Steel and Torrie, 1980) to find out the magnitude of effect of storage on quality of date syrup.

RESULTS AND DISCUSSION

Total soluble solids: Initial total soluble solids were 70% in the date syrup irrespective of any preparatory technique. The results indicated that after a storage period of 90 days, the total soluble solid contents were 70% in the date syrup obtained without any treatment, 69.8% when treated with sodium hydrogen carbonate ($NaHCO_3$) and 70.5% when treated with sodium hydrosulphite ($NaHSO_3$). It is clear from these results that neither any treatment during preparation nor storage intervals exerted any significant influence on the total soluble solid contents of date syrup. These results agreed with those of Benjamin *et al.* (1975), Mohammad and Ahmad (1981), Khatchandourian *et al.* (1983) and Godara and Pareek (1985) in respect of total soluble solid contents in the date syrup during storage.

pH values: The initial pH value for the control sample of date syrup was 5.62 for $NaHCO_3$ treated date syrup, the pH was 6.35 and for $NaHSO_3$ treated syrup, it was 5.35. Storage caused a consistent decrease in pH values in all the date syrup samples. The final pH values after 90 days of storage were 5.21, 6.03 and 5.08 for the date syrup prepared without any pretreatment, or with treatment of $NaHCO_3$ and $NaHSO_3$, respectively.

A significant ($P<0.01$) difference existed among treatments and also for storage intervals. A maximum rise in the H^+ concentration as shown by the lowest pH value was observed in samples of date syrup treated with $NaHCO_3$. Such a situation explains the point that the pH is raised due to $NaHCO_3$ because of its antacid properties and furthermore may initiate the gain of H^+ concentration at a faster rate as the life of syrup is prolonged on storage. Similar rise in acidity during storage was also observed by Godara and Pareek (1985) and Abdollah *et al.* (1988) with proportional fall in pH values.

Total ash contents: Total ash contents were 2.16, 2.27 and 2.27% in control, treated with $NaHCO_3$ and $NaHSO_3$ date syrup samples, respectively. The comparative high ash contents were due to the addition of chemicals for colour treatment. Storage seems to show insignificant influence on the ash content of date syrup.

The date syrup, being low in sodium and high in potassium contents (Anonymous, 1972) can be given advantageously to persons suffering from general hypertension syndrome.

Ascorbic acid: The initial vitamin C contents were 64, 67 and 64 mg 100 ml^{-1} in control date syrup and those treated with $NaHCO_3$ and $NaHSO_3$, respectively.

There was a consistent and significant ($P<0.01$) loss of ascorbic acid during storage of date syrup, though insignificant changes in ascorbic acid were noticed due to preparatory treatments. The vitamin C contents ranged from 34 to 36 mg 100 ml^{-1} after

storage of date syrup for 3 months at ambient temperature.

ascorbic acid was 8% after 30 days, 26% after 60 days and about 44% after 90 days of

Table 1. Effect of storage on some chemical constituents of vitamin C fortified date syrup under different preparatory treatments

Storage (days)	Constituents	Preparatory treatments		
		Control (T_1)	$NaHCO_3$ (T_2)	$NaHSO_3$ (T_3)
0	TSS (%)	70	70	70
	pH	5.62	6.35	5.35
	Ash (%)	2.16	2.27	2.27
	Vitamin C	64	67	64
30	TSS (%)	69.5	69.7	70
	pH	5.52	6.28	5.26
	Ash (%)	2.15	2.26	2.27
	Vitamin C	57	59	54
60	TSS (%)	69.6	69.6	69.6
	pH	5.35	6.15	5.15
	Ash (%)	2.16	2.26	2.27
	Vitamin C	45	47	43
90	TSS (%)	70	69.8	70.5
	pH	5.21	6.03	5.08
	Ash (%)	2.16	2.27	2.27
	Vitamin C	34	36	34

F-ratio values derived from ANOVA

Variation	TSS	pH	Ash	Vitamin C
Preparatory treatments	2.52NS	39.00**	23.57**	2.46^{NS}
Storage	2.28^{NS}	18.75**	3.76^{NS}	161.77**

NS = Non-significant; ** = Significant at 1% level.

The original ascorbic acid content in date syrup was about 15 mg 100 ml^{-1}. Fortification with vitamin C caused substantial increase in ascorbic acid. Overall loss of

storage. The loss of ascorbic acid during storage may be attributed to higher temperature during summer. Similar observations were also reported by Godara and

Pareek (1985). The vitamin C fortified date syrup can be used as a dietary supplement for those requiring high level of this vitamin.

tute for fruit jam and for pure honey table use.

Table 2. Sensory evaluation of date syrup after 90 days of storage in comparison with apple jam and honey

Samples		Colour	Flavour	Taste	Overall rating (out of 30 points)
Date syrup	T_1	6.6 ± 1.14	7.0 ± 0.71	7.0 ± 0.89	20.6 b
	T_2	6.8 ± 1.30	7.0 ± 0.71	7.6 ± 1.14	21.4 b
	T_3	6.0 ± 1.22	6.4 ± 0.55	5.8 ± 1.30	18.2 a
Apple jam		8.0 ± 1.00	9.0 ± 0.40	8.0 ± 0.60	25.0 c
Honey		7.5 ± 1.20	8.0 ± 0.80	8.5 ± 0.90	24.0 c

Results are expressed as mean ± SD for rating of 10 judges out of 10 points for standard of excellence for each attribute (values sharing the same letter are non-significant).

Organoleptic evaluation: The date syrup samples prepared using various treatments were found acceptable even after 90 days of storage as reported earlier by Abdollah *et al.* (1988).

In this study, vitamin C fortified date syrup samples were substituted either for apple jam or for pure honey when applied to bread toasts in the breakfast. These samples were presented to a taste panel comprising ten judges. The organoleptic attributes of colour, flavour, taste and overall acceptability of date syrup samples compared well with those of either apple jam or pure honey (Table 2). Mustafa *et al.* (1982) also reported that the date syrup could replace the table honey without exerting adverse effect on organoleptic characteristics.

It is concluded that date syrup fortified with vitamin C could be used not only as a vitamin C supplement for infants and growing children but also as a convenient substi-

REFERENCES

Abdollah, M.O., M.L. Khan and R.A. Riaz. 1988. Effect of some clarifying agents on the quality of date syrup during storage. Pak. J. Agri. Sci. 25: 304.

Anonymous. 1972. Date Number. The Punjab Fruit J. 33 (114-119): 53.

Anonymous. 1990. Agricultural Statistics of Pakistan. Ministry of Food, Agri. and Cooperatives, Govt. of Pakistan, Islamabad.

Barreveld, W.H. 1971. The industrial use of second quality dates. FAO report, Rome, Italy.

Benjamin, N.D., H. Zubair and W. Al-Tai. 1975. Zahdi date and syrup. 3rd Intl. Palm and Dates Conf., Baghdad, Iraq.

Ehrenberg, J. 1977. Production of liquid sugar from dates. Zucker, 30 (1): 612. (Chem. Abstr. 88: 63485, 1978).

Godara, R.K. and O.P. Pareek. 1985. Effect of temperature on storage life of ready-to-serve date syrup beverage. Indian J. Agri. Sci. 55 (5): 347.

Khatchandourian, H.A., W.N. Saways, J.K. Khalil and A.S. Mashadi. 1983. Processing of five major Saudi Arabian date varieties into date butter and syrup. The Date Palm J. 2 (1): 103.

Krum, J.K. 1955. Truest evaluation in sensory panel testing. Food Engg. 27: 74.

Mohammad, M.A. and A.A. Ahmad. 1981. Libyan date syrup. J. Food Sci. 46 (4): 1162.

Mustafa, A.I., A.I. Hamad, A.N. Wahdan and M.S. Al-Kahtani. 1982. Extraction of date syrup and its utilization in bakery products and juice. Ist Symp. on Date Palm. Al-Hassa, Saudi Arabia.

Ruck, J.A. 1969. Chemical Methods of Analysis of Fruit and Vegetable Products. Pub. 1154, Dept. of Agri., Sunderland, Canada.

Steel, R.G.D. and J.H. Torrie. 1980. Principles and Procedures of Statistics. McGraw Hill Book Co. Inc., New York, USA.