

“Effect of Vapor Gard and Some Preservatives”
On the quality of Date Fruits (Zahdi cv.)
at Rutab Stage During Cold Storage

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ABSTRACT

This study was carried in Agriculture and Water Resources Research Center, Department of Palm and Date. Date fruits (*Phoenix dactylifer*, L.) Zahdi cv. at rutab stage were treated with waxes and preservatives to extend their shelf life during cold storage.

The following treatments were undertaken:

- Vapor Gard (V.G.) which is a waxy material extracted from plants at 4% concentration.
- A mixture of equal weights of sodium benzoate and calcium propionate at 2% concentration.
- A mixture of equal weights of Vapor Gard, sodium benzoate and calcium propionate at 2% concentration.

The fruits were dipped in the solutions for 3 min., dried, placed in carton boxes, and stored in cold room at -3°C ($\pm 1^{\circ}\text{C}$) for a period of 5 months.

Physical and chemical characteristics of the treated and untreated fruits were determined. Fruits treated with V.G. were superior in keeping quality when compared with other treatments and untreated fruits. In the meantime, V.G. reduced the percentage of the defected and shrunked fruits.

INTRODUCTION

Fresh dates are popular among the people of the Near East, specially at “Rutab stage”, they are usually consumed on season, they are less astringent in taste, delicate and distinctive in flavour. It has been understood that the major cause affecting date during Rutab stage is the relative contents of moisture, therefore in order to keep the fruits at this

stage for longer period of time, it requires suitable physical and chemical conditions. There are several methods to preserve fruits including addition of chemical preservatives or physical means. This trial was conducted within a major research programme named "PROMOTION OF MARKETING IRAQI DATES AT RUTAB STAGE". Studying the suitability of microbial preservatives alone and in combination with waxy compounds "Vapor gard" as moisture proofing. All the treatments carried on under refrigeration conditions. Attempts were made earlier to prolong the shelf life of rutab through the application of low temperature either by refrigeration or freezing alone.

Preservation by refrigeration was not sufficient for storage of fresh dates as fungal attack was evident after few days of storage (14). Ammonia liquid was used by Rygg (13), who didn't observe any moulding symptoms on the stored rutab dates at the end of storage period. Mikki (10) indicated that potassium sorbate was most promising as antimicrobial agent when it was used on dates at Rutab stage also was found to be successful for many dried fruits such as figs and prunes (9). Several trials were conducted to use other preservatives with different packaging materials, such as methyl bromide and nitrous oxide (5).

It was noticed that application of chemical and microbial preservatives such as calcium propionate, sodium benzoate, sulfur dioxide, and potassium sorbate in addition to acetic acid had direct and positive impact on keeping fruits at low temperature storage (1,6). Mark (11) stressed that yeast growth was controlled by using the ethylene oxide and methyl bromide, with high concentration and short time.

Waxy compounds have been applied widely in dried and semidried fruits and vegetables to prevent moisture losses, such as Vapor Gard.

MATERIALS AND METHODS

Random samples from 200kg of Zahdi variety at rutab stage, were harvested from one orchard, fruits were cleaned by tap water, dried by air, and then followed by chemical and physical analysis before entering the refrigerated compartments. Total samples were grouped into four batches for treatments:

- 1- Control: fruits were washed by tap water and dried.
- 2- Second Batch; Fruits were dipped in vapor-gard 4% for 3 minutes and liquid (supplied by Miller Chemical and Fertilizer Corporation -AN Alco Standard Company). It is a waxy material used as

evaporation preventive side effect. The batch was dried at room temp and packed in special cartons containers.

- 3- Third batch: This batch was treated with mixture of 2% Sodium Benzoate and calcium propionate ca., dipping time 3 minutes, dried and packed in special cartons.
- 4- The fourth batch dipped in even mixture of 4% V.G. and 2% (sodium benzoate + calcium propionate) for 3 minutes. All fruit samples in the form of spadix fruits stalks, were arranged after treatments in 2 kg cartons, 20 box for each treatment, immediately refrigerated at -3°C ($\pm 1^{\circ}\text{C}$), and relative humidity 75% (± 5).

The physical and chemical properties were identified at the end of the storage period. Monthly changing pattern of the physical properties were registered:

- 1- External appearance: an identified parameters of Zahdi cultivar fruits were specified, as far as their physical deterioration or degree of changes from the original structure of the fruits at certain stage of ratab maturity.
- 2- Tensile strenght: It was measured by counting number of abscised fruits of each pack and the percentage was calculated accordingly.
- 3- Average fruits maturity: was calculated on the basis of increasing percentage of maturity at each stage of ripening up to the end of storage period. Spoiled fruits, shrivelled fruits and those having spot crystals were indicated by eye sight and the percentage was calculated. Eye sight practice was the basis to monitor the degree of changes in the color during storage period. Local and out-sider testers tasted the degree of changes in taste and flavor during storage period. Mold fermented fruits were tested personally by smelling and absolute eyesight for moulding, binocular was used for detailed checking.

Chemical Characteristics:

- 1- Moisture determination: Vacuum oven of 60.4 ml/hg at 65°C was used to follow the moisture content of, an overage of 3 samples, and was repeated monthly of up to the end of the storage period.

- 2- Soluble solids: random clear extract of dates, filtered and drops of the filtrate were used by ABBE refractometer for soluble solids determination.
- 3- Total Acidity: It was determined by usual titration with 0.01 normal solution of NaOH.
- 4- PH: PH – meter 26 was used.
- 5- Total sugars, Reduced sugars and sucrose: were determined using Berlin method stated by (A.O.A.C.).

All results were analyzed statistically according to a complete randomized design, LSD applied at both levels 1% & 5%.

RESULTS AND DISCUSSION

I. Physical properties:

- 1- Wilting: Best results were achieved with treated samples with Vapor-Gard alone and it was significant at 1% & 5% LSD in comparison with the control. Chemical preservatives alone or with the V.G did not appear to be significant with the control at any level. The reason due to the formation of thin layer covering the fruits which prevent moisture losses and also reduce gas exchange and subsequently inhibit metabolic activities, this agreed with the findings of Rygg (13). No wilted fruits could be found of Vapor Gard treated samples during the first month of refrigeration, while there was a slight increase toward the end of the storage period. On the other hand, others while were treated with preservatives affected from the first month continued to the second month and a severe increase was noticed at the beginning of the following months. Table (1).
- 2- Maturity: Significant difference was observed between V.G treatment and the control, positive results were also obtained with mixture of V.G and the preservative, delaying in maturation of the V.G treated fruits obviously due to the functional impact of the synthetic layer of wax surrounding the fruits. Among all treatments including the control, the increase in the degree of maturity continued along with the progress of the storage.
- 3- Tensile strength: No significant difference was noticed among all treatments, this might be related to the high degree of T.S.S of the Zahdi

FIG (1): MONTHLY PATTERN OF WILTED FRUITS DURING STORAGE PERIOD

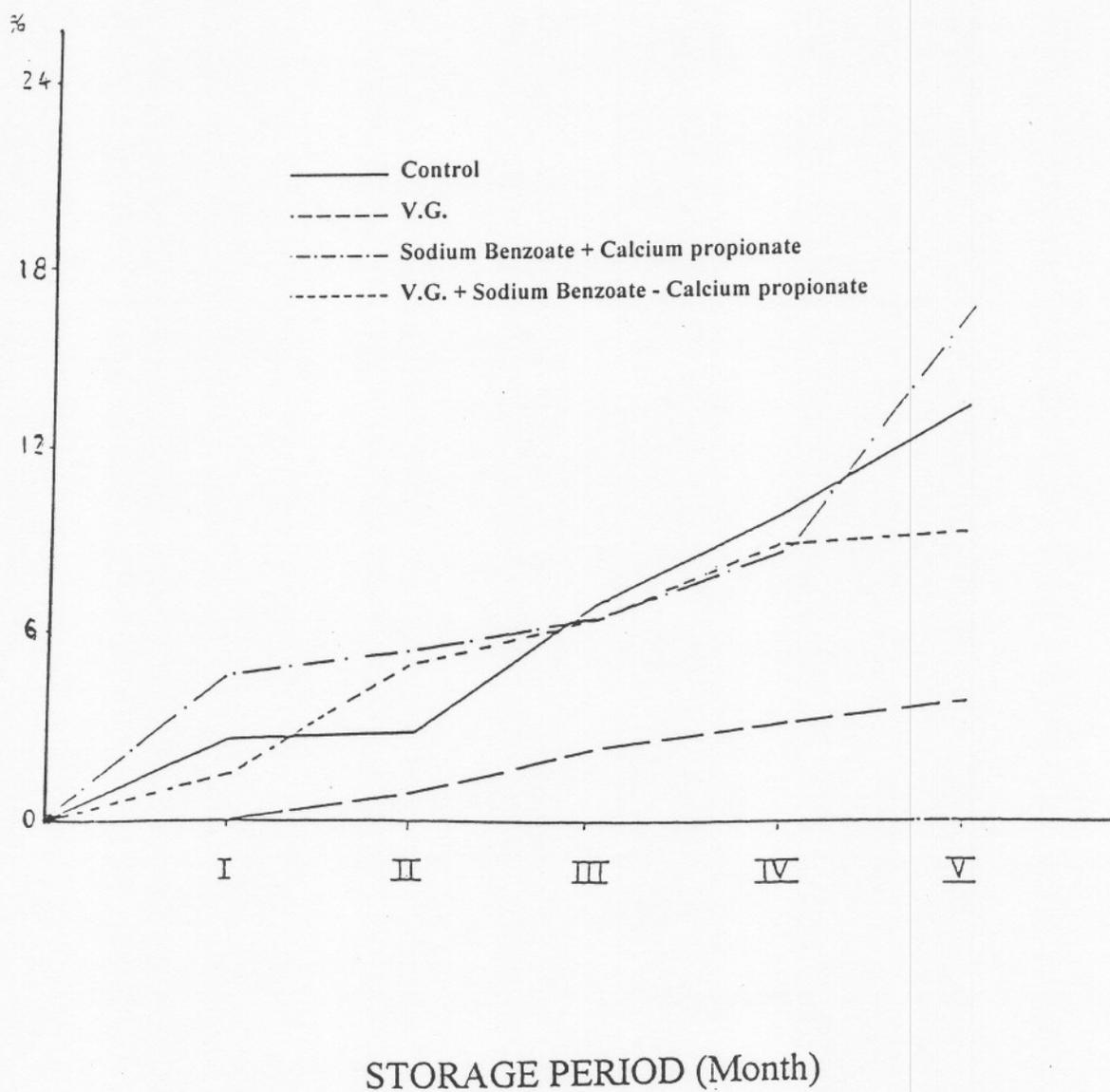
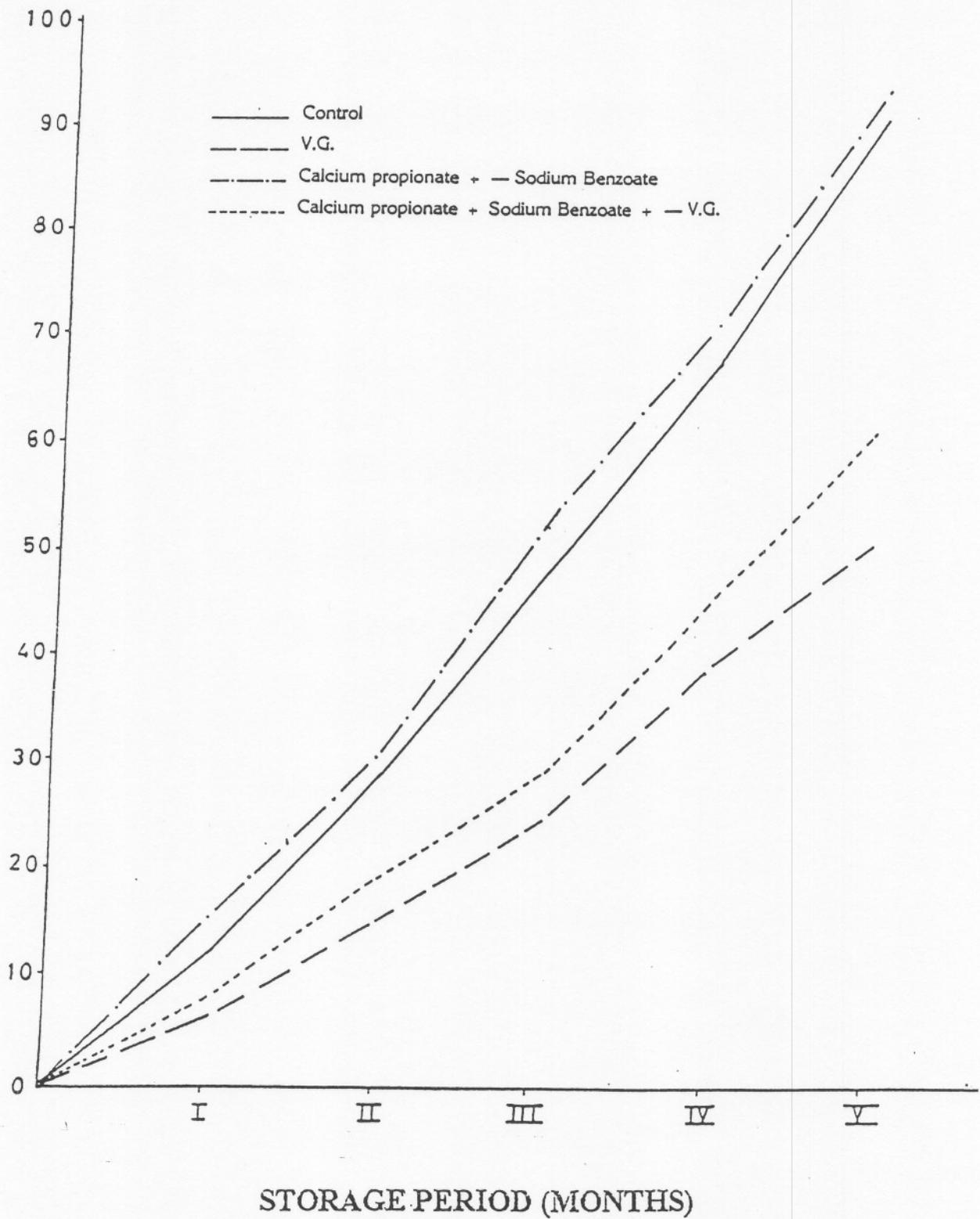


FIG.(2) AVERAGE INCREASE OF FRUITS MATURTION DURING STORAGE PERIOD



variety. In general Vapor Gard had an excellent impact on the external appearance of Zahdi dates Fig. 2.

II- Chemical Properties:

1- Moisture: periodic examinations of chemical properties of date fruits during storage revealed significant differences among various treatments, as far as moisture contents and consequently of soluble solid contents of stored dates. As evident from Table (2). V.G treatment sample showed a minimum loss in moisture with significant figured 8.286%, as far as the monthly pattern lossed Fig (3), the greater loss occurred in the first month, and all treatment loss continued up to the third month, then stayed constant, except for V.G treated fruits was observed after the second month.

2- Soluble solids: (S.S) Naturally greater losses of moisture resulted in higher level of S.S. stored dates, of the control Fig (4) clearly indicated that steadily and continuous increase in S.S. of non treated fruits up to the end of the storage period, whereby wax treated samples revealed little increase of the first two months followed by tailing decrease in S.A. to the end of the storage period. This might be attributed to the inhibition of metabolic activities on carbohydrates (1), (2).

3- Total Acidity: In general all treatments were subjected to an increase in total acidity at the end of storage period, inspite of insignificance of the data, except that of preservatives treatment, this due mainly to the inhibition effect at 5% level were noticed among treatments, Table (2).

4- Sugars: Aside from the control treatment which measured the highest level of total and reduced sugars, no significant difference were indicated between non treated samples and treated ones. On the other hand, clear decrease in all sugar contents were recorded with a mixture of V. G. and preservatives treated dates.

The final conclusion from the current findings support the application of waxy material such as Vapor Gard to maintain good quality of Zahdi variety at rutab stage under refrigeration for at least few months, having in consideration, there is no side effect of this material on humans. This trial will enhance dates exporting programs, especially Zahdi variety at desired stage (Rutab), as well as for domestic use.

The authors suggest more research and detailed field studies to be Performance of other commercial varieties at different stages of maturity.

FIG.(3) MONTHLY PATTERN OF MOISTURE LOSS OF FRUITS DURING STORAGE PERIOD

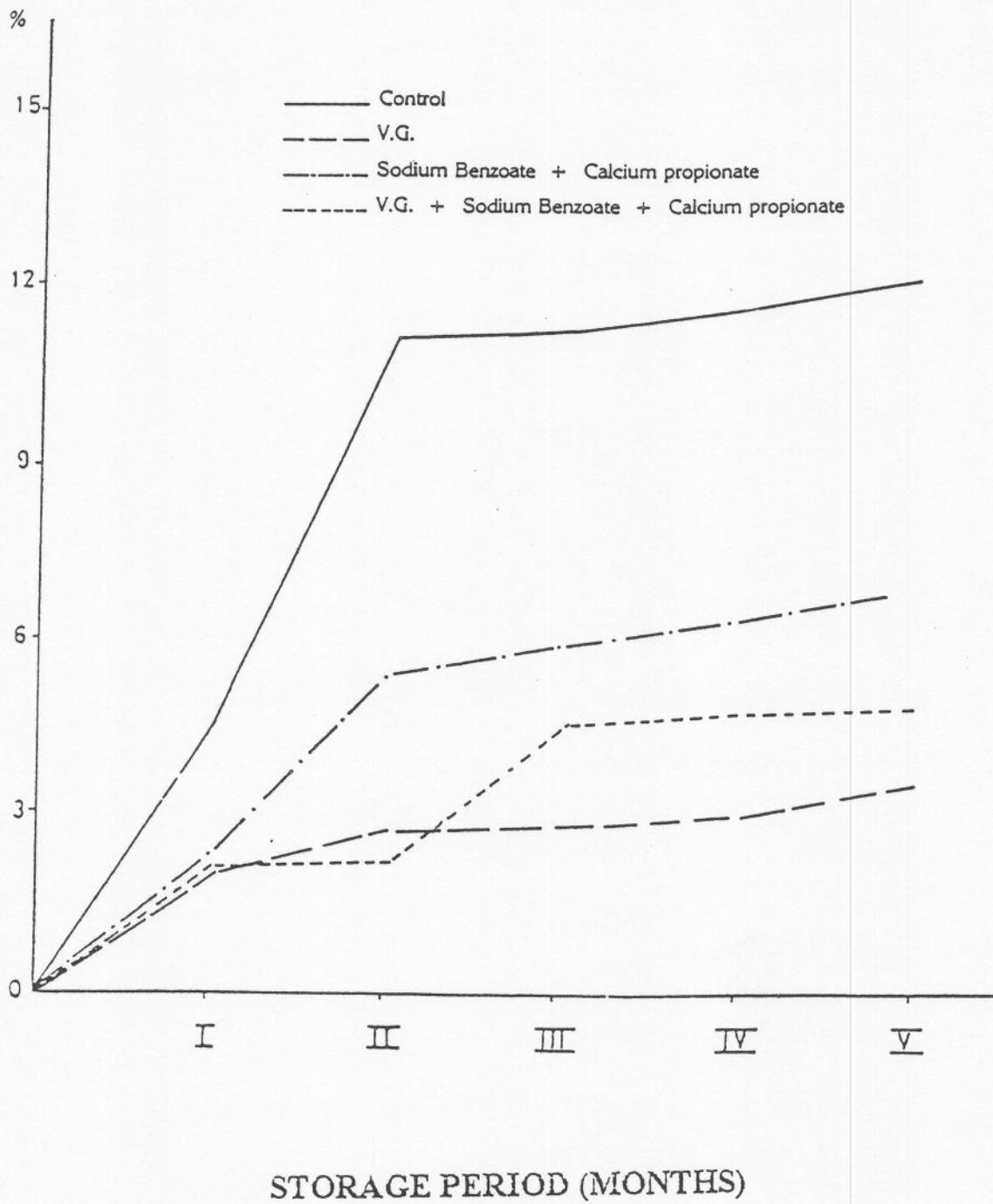


FIG.(4) MONTHLY PATTERN OF SOLUBLE SOLIDS DURING STORAGE PERIOD

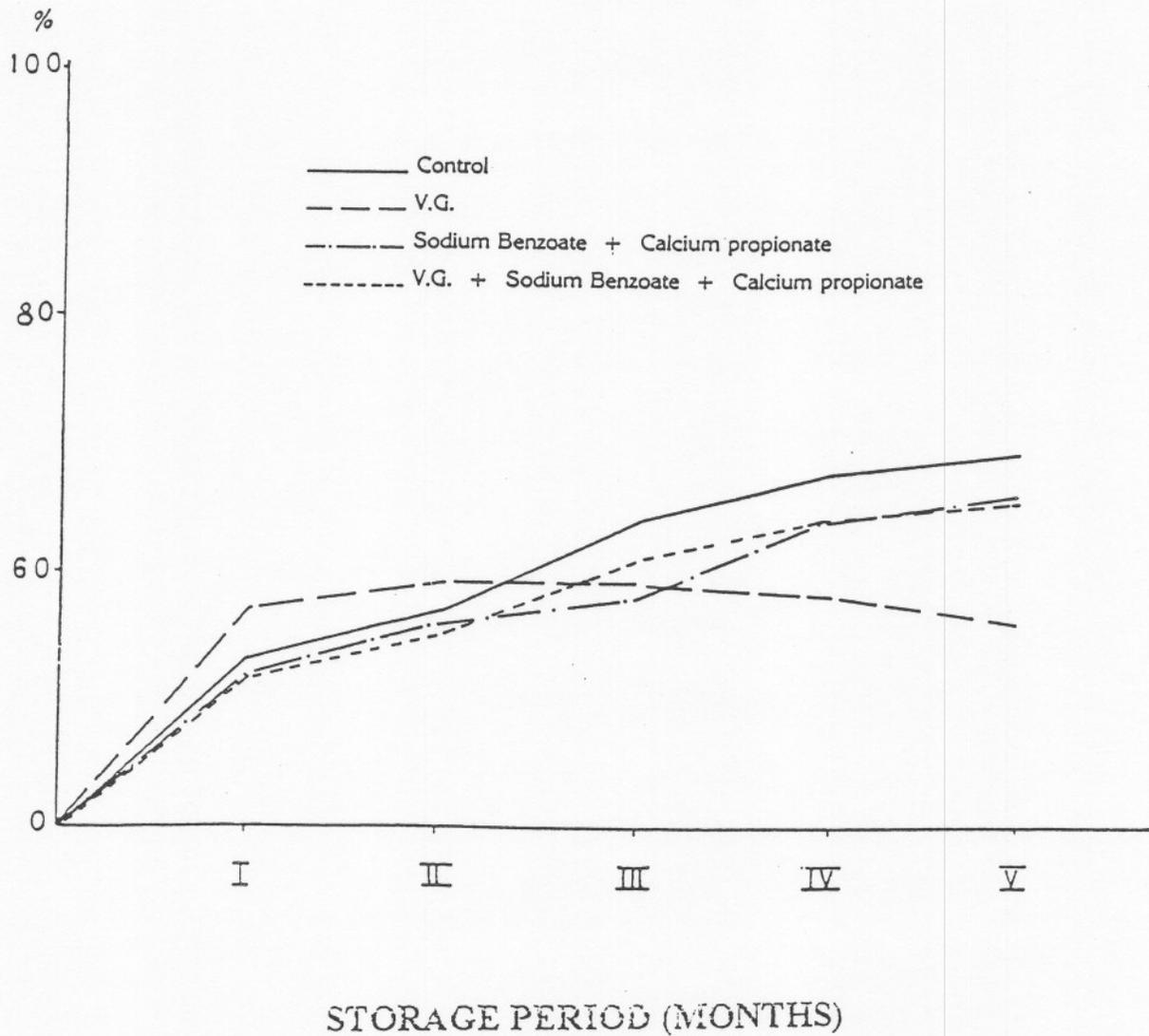


Table 1. Physical properties of stored dates

Crystallization	External appears	Taste & Flavour	Colour	Deterioration %	Tensile strength %	Monthly Ripening %	Wilting %	Treatments
-	Medium	Natural	Brown	2.016	4.750	49.724	7.126	Control
-	Good	Natural	Brown	0.440	2.670	27.120	1.988	V.G.
-	Medium	Natural	Brown	1.650	4.050	52.840	9.330	Sodium Benzoate + Calcium Ppropionate
-	Good	Natural	Brown	1.016	4.040	32.692	6.090	V.G. + Sodium Benzoate + Calcium Propionate
-	-	-	-	3.356	N.S	14.867+	3.696+	%1 LSD
-	-	-	-	2.393	N.S	10.604+	2.636+	%5 LSD

Table (2) Chemical properties of stored dates

Surose	Invert Sugars %	Total Sugars %	pH	Total Acidity	Soluble Solids	Loss in Moisture %	Tretments
13.101	68.519	81.620	6.630	0.023	62.60	10.158	Control
12.391	67.070	79.430	6.770	0.040	57.06	2.872	V.G.
12.511	65.470	77.980	6.0710	0.051	59.200	5.365	Sodium Benzoate + Calcium Propionate
8.806	65.540	74.340	6.770	0.041	59.700	4.122	V.G + Sodium Benzoate + Calcium Propionate
8.999-	2.793-	3.483-	3.978-	0.029-	2.382-	2.413+	%1 LSD
2.139-	1.992-	2.484-	2.837-	0.020-	1.699-	1.721+	%5 LSD

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