

The effect of the sheets containing Meta-B sodium sulfite on organoleptic characteristics in raisin type, Sahebi, and la'l grapes in the refrigerator.

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ABSTRACT

Field and the target: in order to check the effect of the sheets containing Meta-B sodium sulfite on organoleptic characteristics of raisin type, Sahebi, and la'l grapes in the refrigerator a survey has been carried out.

Material and methods: this survey was carried out in the refrigerator of the technical and vocational center of Shirvan in 1389 in the form of a factorial test with a completely random base with 3 treatments and 3 repetitions. The cluster harvest was done in Shahrivar 20th. After the primary cooling and separation of flawed and contaminated grapes, the grape guard sheets containing Meta-B sodium sulfite with different concentration ranges including 7%, 10%, and 15% were placed at the bottom center of the boxes and 5 kg of grapes were put in each box. The boxes were transported to a refrigerator with the temperature 0 centigrade degree and relative humidity ranging 90-95 percent and were kept there for 12 weeks. At the end of the 12th week the organoleptic characteristics including appearance, taste, and the color of the fruit were evaluated according to questioning different people's ideas.

Results: the results of the tests showed that organoleptic characteristics such as whitening, wrinkling, drying and turning brown of the cluster's wood, shed, and the taste had a significant decrease by using sheets containing Meta-B sodium sulfite.

In this survey the Meta-B sodium sulfite sheets with 13% concentration caused the better reserving of organoleptic characteristics of grapes and the amount of remaining sulfite in grapes was within the standard range at the end of the piling period and these characteristics were best kept in raisin type comparing to Sahebi and La'l types.

Discussion: to keep the grapes in a refrigerator, using sheets containing Meta-B sodium sulfite avoids the reaction of respiration and humidity loss or weight loss and as a result avoids wrinkling and drying the cluster's wood that is caused by the fruit humidity loss by gradually emitting sulfur dioxide gas.

KEY WORD: fungal contamination, grape, decay control, sheets containing Meta-B sodium sulfite.

INTRODUCTION

Iran is considered to be one of the most important areas for grape cultivation due to having suitable geographical and climate conditions. The northern Khorasan province is among the important areas for grape cultivation in the country and the widest area of cultivation is devoted to raisin type grapes. Grape is one of the most important horticultural products, which uses special refrigerators by using sulfur carbon dioxide or Meta-B sodium sulfite to keep it fresh for use or for foreign or domestic consumption.

In order to control decay, decreasing the browning of the cluster's wood and the grain, wrinkling, and lengthening the piling life, the releasing sheets of sulfur dioxide are being used these days.

Sulfur dioxide is more used for food which gets dry and for other cases combinations, which produce sulfur dioxide gas are used especially Meta-B sodium sulfite.

In foreign countries in order to reduce the side effects of sulfur dioxide gas (corrosion of evaporator pipes in refrigerators), materials which emit this gas over time are used.

These materials (grape guard sheets) are sulfate papers and contain Meta-B sodium sulfite and potassium and are placed at the bottom of grape boxes. These materials get analyzed due to the humidity of the refrigerator and as a result release sulfur dioxide gas. Fruit and vegetables decay and get destroyed because of the attack of different microorganisms and humidity loss during the storage in the refrigerator. Using materials and methods, which minimizes the humidity loss and contamination of grapes will lengthen the life and preserve the appearance characteristics.

Grape is among those rare kinds of fruit in which the cluster's wood is considered to be an important factor in quality. The wood is the first part to dry. Temperature is the main reason for the color change of the wood and making the grains brown in the refrigerator by happening so a huge change happens in color, and the taste of the grape and finally the quality decreases. This survey was done to lengthen the life of the grapes while keeping the organoleptic characteristics in storage.

MATERIALS AND METHODS

In order to execute the plan, a vineyard in a village called Verg in Shirvan was chosen. On the 20th of Shahrivar, 1389 the harvest started in the morning and after that the product was transported in shadow and was kept between 6 to 24 hours in 4 to 5

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centigrade degree. Right after the harvest fungal contamination, grain decay, peduncle length, width and the length of the cluster, width and the length of the grain, average weight of the grain, and the weight of the cluster were all measured.

Before the measurement of the grapes all the contaminated grains, unripe and smashed grains were separated and the clusters were uniformed in terms of size and density.

The refrigerator and the boxes were all sterilized by whitening liquid before use.

Meta-B sodium sulfite sheets with concentration of 7, 10, and 13% were placed in two rows. One at the bottom and other in the middle of the box wrapped in 2-ply Absore papers.

5 kg of grapes were placed in each plastic box. Treated boxes were kept for 12 weeks in zero degree with relative humidity as much as 90%. Necessary tests were done at the end of the storage period according to the following methods.

To calculate the weight loss of the clusters in each test unit, one cluster was chosen and put in punched freezer bags and then placed in the boxes. And at the end of the storage period their weight was measured and registered.

The grain whitening: in order to measure the white stains caused by sulfur dioxide gas on the fruit, a random sample with 50 grapes free of fungal contamination was chosen out of each testing unit. They were examined under the white light with 2x lenses and were categorized under the following categories.

No stain 2) low 3) average 4) intense 5) very intense

Wrinkling and browning of the clusters ranked into 5 degrees. (Dolati baneh, 1378)

None 2) low 3) average 4) intense 5) very intense

Wrinkling of the grains was also ranked in 5 levels based on observation.

Extremely wrinkled 2) a bit wrinkled 3) ordinary 4) plain 5) completely plain

The taste of the grains based on people's ideas was categorized in 5 levels.

Inappropriate 2- average 3- good 4- very good 5- excellent

The evaluation of grain shed was done by holding the cluster by the tail in a vertical way and hitting it in distances as long as 5cm by ordinary hits 3 times. According to the number of grains separated from the cluster, each cluster was categorized in 5 groups. 1-very low 2- low 3- average 4- intense 5- very intense

In the end the results of measurements were calculated and analyzed by MATAT-C program.

Table 1: the quantity properties of freshly harvested grapes (average of 30 clusters)

Quantity Property type	Fungal Contamination percentage	Grain Decay percentage	Peduncle Length cm	Cluster Length cm	Cluster Width cm	Grain Length cm	Grain Width cm	Cluster Weight gr	Grain weight gr
raisin	1	1	3.18	22.68	11.34	1.50	1.30	184	375.2
La'l	2	2	5	23.25	10.44	1.96	1.81	381	212.3
Sahebi	2	2	3.25	13.26	13.26	2.33	1.68	471	273.2

Table 2: analysis of evaluating variance in test

Change sources	Freedom degree	Fresh Grapedecay percentage	Grain decay after week 4 percentage	Grain decay after week8 percentage	Grain decay after week12 percentage	Weight loss after week12 percentage	Remaining sulfite after week 12
Cv%		26.19	18.86	7.39	6.83	6.12	2.26
Test Error	24	0.320	0.01	0.528	1.11	0.51	0.01
Types * concentration	6	0.07 ^{ns}	0.00 ^{ns}	526.13 ^{**}	712.76 ^{**}	17.69 ^{**}	1.21 ^{**}
Types concentration	2	1.68 ^{**}	0.69 ^{**}	546.58 ^{**}	778.03 ^{**}	45.52 ^{**}	12.84 ^{**}
concentration	3	0.12 ^{ns}	0.04 [*]	2692.07 ^{**}	5783.63 ^{**}	813.26 ^{**}	42.97 ^{**}

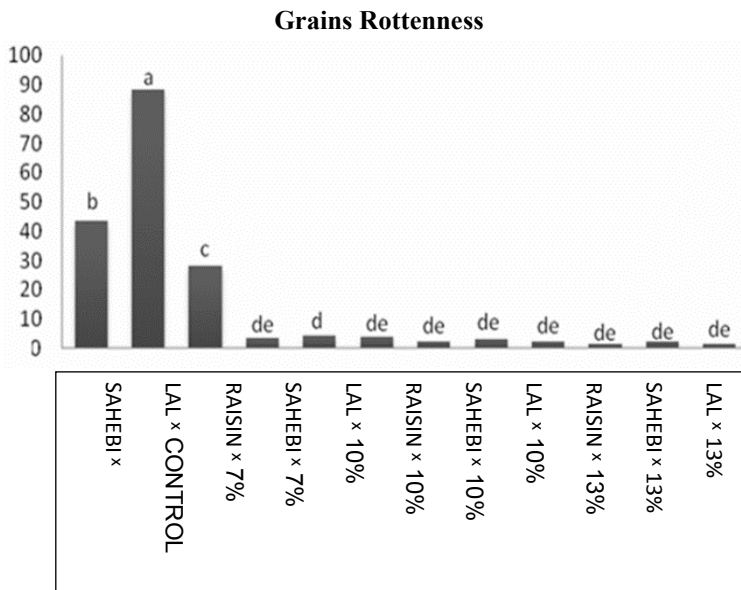
Table3: comparing the average effects of different concentrations of Meta-b sodium Sulfite with the kind on qualitative and quantitative properties

	1.73- a	0.65- bcd	1.00- d	1.66 -de	3.34 -g	4.70 -d
ruby%13×						
sahebi%13×	1.56 -a	0.80- abc	1.00- d	2.33- de	7.02 -f	6.75 -b
raisin%13×	1.13- a	0.33 -d	1.00 -d	1.33 -e	1.43 -h	7.69 -a
ruby%10×	1.73- a	0.66-bc	1.00 -d	2.33-de	10.18 -e	3.37- f
sahebi%10×	1.63 -a	0.96 -ab	1.33 -d	3.00 -de	7.97 -f	4.78- d
raisin%10×	0.96 -a	0.50 -cd	1.00 -d	2.33- de	2.40 -gh	6.21- c
ruby%7×	1.86- a	0.73 -abc	1.33- d	4.00 -de	9.81 -e	2.47- g
sahebi%7×	1.67 -a	1.03 -a	1.66- d	4.33-d	12.40- d	3.88- e
raisin%7×	1.43 -a	0.50 -cd	1.33-d	3.66-de	10.54- e	4.54- d
ruby×Shahed	2.10-a	0.68-cd	23.33-b	28.33-c	22.68 -c	1.03-i
Sahebi×Shahed	1.90-a	0.95-ab	66.33-a	88.33-a	27.93 -a	1.20 -hi
raisin×shahed	1.03-a	0.50 -cd	17.67-c	43.67-b	25.48 -b	1.34 -h
Quality and quantity density ×number	%1	%1	%1	%1	- %1	- %1
	Fresh grapes rot "percent"	the cubes decay after the Week 4 "percent"	the cubes decay after the 8 Week "percent"	the cubes decay after the 12 Week "percent"	Weight loss after 12 weeks 'percent'	Remained sulfite after 12 weeks

RESULTS

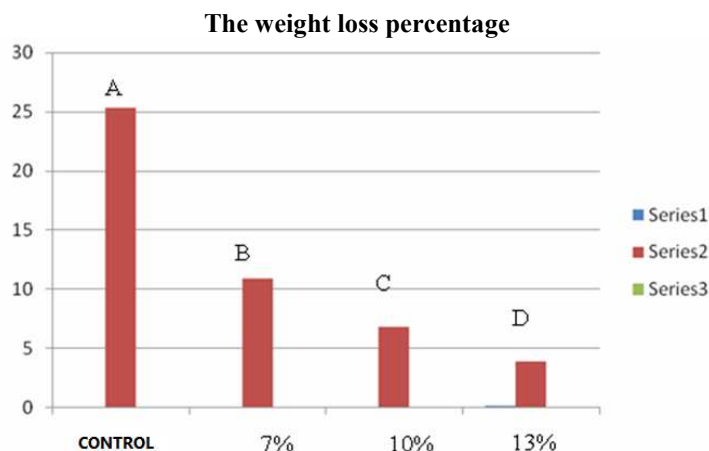
Rottenness percentage

The results of statistical analysis demonstrated that the independent effect of Sodium metabisulfite sheets and the rottenness percentage was significant at 1% level of probability. According to the table comparing mean of concentration reciprocal effects and kind on quantitative and qualitative properties of grapes, the highest percentage of rottenness obtained for the kind of Sahebi Control Grapes and it was 88.33 and the lowest percentage of rottenness obtained for raisin grape in Sodium metabisulfite solution of 13% and it was 1.33.



Percentage of weight loss

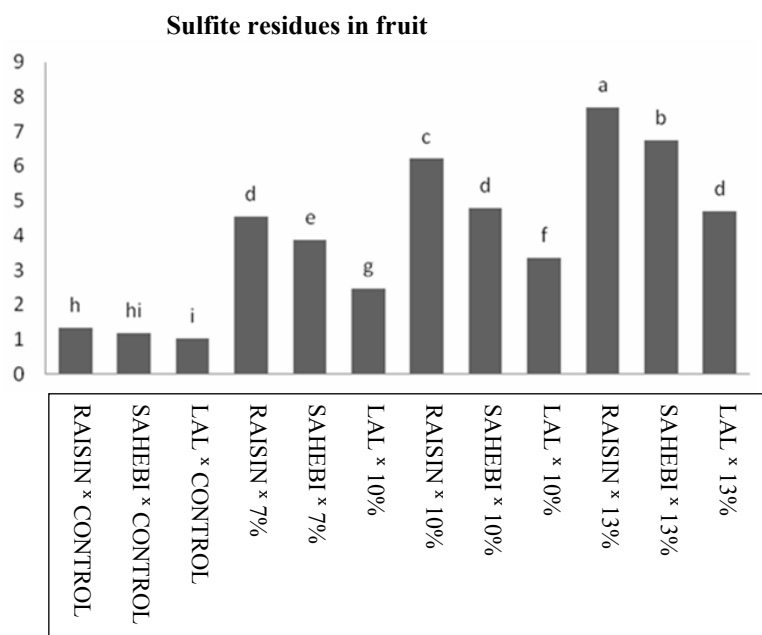
As compared to the control, the weight loss factor showed that the independent effect of Sodium metabisulfite concentration and kind on weight loss was significant at 1% level of probability. The highest mean of weight loss was 27.93 in Sahebi control grapes and the least percentage of weight loss was 1.43 in raisin grapes with sheets with concentration of 13%.



Sulfite residues in fruit

The statistical analysis demonstrated that the independent effect of Sodium metabisulfite sheets concentration and kind on the amount of Sulfite residues in grains at the end of storage period was significant at 1% level of probability. The greatest amount of sulfite remained in the raisin grapes in treatment with metabisulfite sheets with concentration of 13% was 7.69 and the lowest amount of Sulfite residues in the kind of Lal treatment was 1.03, which was not more than standard level in all treatments.

The amount of sulfite residues in grains is in terms of a Part per one Million, and the allowed level in grapes is 10 ppm.



DISCUSSION

The results of rottenness percentage of these findings were in line with the Poolou, Sharayei, et al. where they reported that using grape guard sheets results in reduction of fungal contamination and rottenness of grains. Ooztourk that states that when grape guard sheets are placed in grape boxes, Sulfur dioxide is released in low temperature and frigid humidity and prevents fungal growth especially *Botrytis*, and maintains the green color of cluster's wood. With regard to the fact that grape guard sheets gradually release sulfur dioxide gas and this gas disinfects the grains and control the fungal that are even active in the low temperature of the fridge (10). The result of rottenness percentage of this finding along with Dong's research showed that the weight loss of Soltani grape was significantly less in treatment with the covering without hole accompanied by grape guard sheets than covering with hole (9). Dolati Bane reported that the weight loss of fruit during the storage time in fridge is because of loss of water. This finding is in line with their results. Since fruit cells have respiratory activity, some of fruit water is consumed for this activity, and on the other side because of high rottenness more water is released from the fruit and the weight loss percentage increases (6). In fact, the sheets containing Sodium metabisulfite preserve the grains' moisture and prevent the weight loss due to their prevention of grains' wrinkle. The results of this research along with Shrayei's showed that sulfite residues will increase with increasing the concentration of sheets containing Sodium metabisulfite (5). And in comparing between using 1 and two grape guard sheet and using covering with and without hole, Dolati Bane reported that in treatment with 2 grape guard sheets and covering with hole, the amount of sulfite has increased due to the increase in the concentration of sulfur dioxide (6).

The amount of sulfite remained in grapes depends on the kind of grapes and the concentration of grape guard sheets and the increase in that results in awful taste in fruit.

If the amount of sulfite residues in grapes is more than the allowed level, it will cause problems in Gastrointestinal, and the supply of the product to the market should be avoided. It seems that, the grapes which have more water, the amount of sulfite remained in them is low at the end of storage period. The results of this research showed that Sodium metabisulfite sheets can control fungal infection of grapes during their storage in fridge. Treating the grapes with sheets containing Sodium metabisulfite preserve the appearance of the cluster due to controlling fungal infection, and it reduces the amount of weight loss significantly in comparison with control grapes. Also, because of using different concentration of sheets containing Sodium metabisulfite, the sulfite remained in grains was less than 10 ppm at the end of storage period and the taste of grape has not changed. Therefore, as an overall conclusion, it can be said that since the raisin type preserved the main features such as facial features and had less weight loss, it is economically important and using sheets containing Sodium metabisulfite with concentration of 13% results in better maintenance of these features. The raisin grape was the best type among the tested types, and the sheets containing Sodium metabisulfite with concentration of 13% was the best treatment.

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