ISSN 2063-5346 *Section A-Research paper*

Effect of some pre-harvest treatments as a safe coatings on some physical and chemical properties and extending storage life and marketing of Star Light grapes fruit.

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Abstract

Edible coatings are an alternative for reducing postharvest loss and increasing market life of fruits, thus retarding their deterioration. This investigation aimed to study influence of safe coating application of "Star light" grape with Sodium Alginate ((NaC6H7O6)) 2%, Aloe Vera gel (1:3) ratio with water , Ethanol-extracted Propolis 4% and Grapefruit Seed extract 1% each alone or in combination between them as compared with Control vines (sprayed with water). All coating postharvest treatments were done as spray clusters at one day before harvest. The Sprayed clusters were cold stored up to 8weeks at 0 °C and 90–95% R H followed by stored 12 days at 10 °C and 70–75% R.H. as marketing life . Fruit quality was evaluated at harvest, during cold storage and during market life. Results showed that decay, total soluble solids and respiration rate increased whereas, berry adherence, total acidity and total phenols decreased by increasing storage and marketing periods. All coating treatments decreased decay, weight loss and delayed the physiochemical changes compared with control during storage periods. Also, the best results of 12 days market life obtained by all safe coating treatments. The study suggests that coating treatments might be a promising candidate as maintain Star light grapes with high quality for longer time in markets after storage for a certain period as meet international market exportations.

Key words: Grape**,** Coating**,** Quality**,** Grapefruit Seed extract, propolis**,** Alginate, Aloe Vera gel Cold Storage and market life.

Introduction:

Grape (*Vitis vinifera L*) is one of the most important fruit crops in the world, where the demand for fresh and dried fruit in market becomes more competitive, consumers demand high quality (Leng *et al.*, 2022). Grape is cultivated in many countries of the world. More than 72 million tons of grapes are grown annually around the globe. In Egypt Grapes are cultivated in an area of 73351 ha. With a total production 1626259 tons and productivity of 11.1 tons/ha. (FAO Stat, 2020)

Starlight is a new export variety a pink mutation of the early white Prime Seedless grape. Starlight is a sweet early season seedless red grape; harvest in Egypt is end of May until mid-June. The variety was grown in Egypt and South Africa. Berry is generally round, medium size, usually

in the range of 18-20mm. The color is a light red, slightly pink. The flesh is fairly crisp with very good levels of sweetness and low acids.

The table grape is a non-climacteric fruit with a relatively low rate of physiological activity. Therefore, following harvest, it is very perishable and begins to deteriorate by severe losses during storage and long distance transport. The table grape suffers severe quality losses due to different spoilage and pathogenic microbial species during post-harvest storage (Jayawardena *et al*., 2018). Rapid moisture loss, which results in rachis (cluster stem) drying and browning, mass loss, berry shatter, wilting and shriveling of berries are some of the main quality problems experienced during postharvest handling, thus negatively affecting the sensory properties of grapes causing quantitative and quality losses and as a consequence, the product becomes un market (Sortino *et al.,* 2017). Also, inappropriate handling processes are the main reason for weakening the natural defenses of grapes and making fresh grapes more susceptible to decay and subsequent deterioration

The reduction of losses Postharvest deterioration of table grapes generally results from physical, physiological, or pathological factors causes economic losses, reduced market life and decrease in overall grape quality. Therefore, it is necessary to pay increasing attention to lengthening the marketing-life of Table grape for export by Prolong cold storage time and maintain grape quality.

The use of edible coatings has been widely studied and considered to preserve the quality of fresh fruits as well as prolonging their post-harvest life (Gomes *et al.,* 2017; Rahmawati *et al.,* 2017; Takma and Korel, 2017).

Alginate is a natural polysaccharide that is extracted from brown seaweed called *Macrocystis pyrifera* of the family Phaeophyceae and comprises the two uronic acids, _-D-manuronic and _-L-guluronic. Sodium alginate consists of block polymers of sodium poly-L-guluronate, sodium poly-D-mannuronate, and alternate sequences of both sugars (Parreidt *et al*., 2018).It is forming a film used as a thickening agent, gelling agent, and stabilizer in a variety of food emulsions (McClements *et al* ., 2004). Sodium alginate has been effective in maintaining the postharvest quality of peaches(Maftoonazad, *et al*., 2008), and sweet cherries (Díaz-Mula *et al*., 2012) ,strawberry fruits (Guerreiro *et al*., 2015), plum (Yousuf, *et al.,* 2018) blue berries (Duan, *et al.*, 2011) and enhance shelf-life of), grape fruit (Aloui *et al*., 2014) and strawberry (Peretto *et al*., 2017).

Aloe vera is a short-stemmed succulent plant species belonging to family Liliaceae (Misir *et al*., 2014). Aloe vera is a succulent drought-resistant plant and possesses anthraquinones, saccharides, vitamins, and low molecular-weight substances with commendable therapeutic properties (Sánchez-Machado *et al*., 2017). Aloe vera gel is a tasteless, colorless, and odor-free gelatinous material that contains several potentially active constituents like flavonoids, phenylpropanoids and coumarins, phytosterols, chromone and anthraquinone, phenyl pyrone, glycoside and phenol derivatives (Kahramanoğlu *et al*., 2019). Aloe vera natural plant extracts can be applied as edible coatings for prevent loss of moisture and firmness, reduce decay, respiration rate and maturation, prolong the shelf life and delay changes in parameters related to deteriorat ion of quality in table grape (Valverde *et al.,* 2005& Serrano *et al*. 2006), nectarines (Ahmed *et al*., 2009) and sweet cherries (Martínez-Romero *et al*., 2006).

Propolis is a natural resinous compound produced by Apis mellifera bees produced by Apis mellifera honey bees from which they extract from various plant exudates and behave as hives protection layer against microorganisms such as fungi and bacteria proliferation (Meneses *et al*., 2009). Propolis extract is natural glue with main constituents being resins (50%), composed of flavonoids and phenolic acids and their esters, waxes (30%), and essential oils (10%), pollen (5%) and various organic compounds (5%) (Juliano *et al*., 2007). IT is extracts possess antimicrobial activity and contain some hydrophobic compounds able to improve a few properties of biodegradable coatings on fruits **(**Zahid *et al*., 2013). Its extracts is a good option of coating material with respect to its origin, and it is presumably safer for both the consumers and the environment when used as a substitute to synthetic materials commonly used in postharvest conservation of fruit (Passos *et al*., 2016)

Grapefruit seed extract (GSE) is a commercial product derived from the seeds and pulp of grapefruit (*Citrus paradisi*, family. Rutaceae). It contains large quantities of poly phenolic compounds, such as catechins, epicatechin, epicatechin-3-O-gallate, dimeric, trimeric and tetrameric procyanidins (Xu *et al*., 2007).. Grapefruit seed extract (GSE) has been shown to possess safe antibacterial, antiviral, antifungal, antiseptic, cleaning properties and pre-and post-harvest plant protection agents, delay rachis browning and dehydration and maintenance of the visual aspect of the berry without detrimental effects on taste, or flavor and maintaining the quality of 'Redglobe' grapes stored. (Xu *et al*., 2007). GSE also exhibited certain physical logical and biochemical roles during postharvest cold storage by lowering the respiration rate and ethylene evolution as well as increasing the antioxidant capacity and antioxidant enzyme activity in the whole cluster of grapes (Taoxu *et al*., 2009). Grapefruit seed extract is potential to control gray mold, caused by *Botrytis cinerea* without causing any injury or harmful effects on bunches, also environmentally safe without toxicity to human (Tarabih and EL-Metwally,2020)

The main objectives of this study were to evaluate the effects of some safe coating treatments as Alginate 2% ,Aloe Vera gel (1:3) ratio with water , Ethanol-extracted propolis 4% ,Grapefruit Seed extract 1% alone and in combination between them as compared with Control vines (sprayed with water)done at one day before harvest (10 June) for Reducing decay and losses percentage ,Delaying deterioration, maintaining quality, Extending the storability and marketing season and increase the period of shipment during export of starlight grapes.

Materials and methods

Fruit material

"Star light" grape (*Vitis vinifera* L.), 4 years old were used as the plant material for this study. Grapevines grown on a private farm in Sadat region at Monofeya Government, Egypt. Grapevines received normal cultural practices were selected The present investigation was carried out during the two successive seasons 2020 and 2021 .Grapevines devoted for this work were healthy, carefully selected as being representative of the chosen cultivar and as uniform as possible in vigor and shape .Thirty three vines were selected in a completely randomized design and divided into 11 groups. Each group was replicated three times and each replicate was represented by one vine.

Safe Coating Treatments

1-Ethanol Propolis Extract (EEP) 4%

3- Alginate (ALG) 2%

4- Aloe Vera gel (1:3) ratio with water (AVG)

5- Ethanol Propolis Extract (EEP) 4%+ Grapefruit Seed extract (GSE) 1%

6- Ethanol Propolis Extract (EEP) 4% + Alginate2% (ALG)

7-Ethanol Propolis Extract (EEP) 4% + Aloe Vera gel (1:3) ratio with water (AVG)

8-Grapefruit Seed extract (GSE) 1% + Alginate (ALG) 2%

9-Grapefruit Seed extract (GSE) 1% + Aloe Vera gel (1:3) ratio with water (AVG)

10- Alginate (ALG) 2% + Aloe Vera gel (1:3) ratio with water (AVG)

11- Control (sprayed with water as untreated clusters)

Preparation of safe coating solutions

Preparation of Alginate : Alginate solution (alginic acid sodium salt from brown algae purchased from Sigma company) was prepared according to Rojas-Grau *et al*.(2007) 20 grams of sodium alginate (NaC6H7O6) was dissolved separately to make 2% concentration (w/v) dissolved in sterilized distilled water and heated at 70°C, until the solution became clear. After cooling to 20°C, glycerol (C_3H_5 $(OH)_3$, 85% purity) at 2% v/v was added as plasticizer to a concentration of 2g/100 ml solution. The final volume of solution was made to 1litre.

Preparation of Aloe vera: Aloe vera leaves (var. *Barbadenisis miller*) must be processed within 2 hours of harvesting to prevent oxidation of the gel due to their exposure to air. Whole leaves were washed with water and the base and tips of the leaves along with its spikes were removed. Next, the skin was carefully separated from parenchyma to obtain Aloe vera flesh. The flesh was then washed and blanched in hot water at 100°C for 4 minutes. Before pasteurization, the pH of the gel was adjusted to 3.0 by the addition of citric acid to stabilize and prevent browning. The process was then continued with pasteurization at 85°C for 1 minute. After pasteurization, the gel was quickly cooled to 5°C or below. Finally, the Aloe vera gel was filled into pre sterilized, opaque glass bottles for storage in a chiller at 5°C and 75-80% relative humidity. Accordingly, coatings of Aloe vera gel solution was made in 1:3 ratio with water (Ramachandra and Rao, 2008**).**

Preparation of Propolis extract: Propolis extract brown type, Crude propolis was first subjected to pre cleaning, with cold wash, and dried under an air circulation at 60 °C for 10 h. Next, it was packed into polyethylene bags and freeze stored at −5 °C for 12 h. Then, a 100-g aliquot was ground in a blender, packaged into amber glass bottles; and the volume was made to 1 L with 70% ethanol (1st dilution). The suspension was allowed to stand for 5 days at room temperature (25 ± 1°C), with hand stirring for 1 min once every day; afterwards, it was filtered through quantitative

filter paper**.** Last, the hydroalcoholic extract of propolis extract was diluted in 70% ethanol (2nd dilution) .The solution was used as stock solution to be used to obtain final concentrations of 4% as ethanolic f propolis extract **(**Ali *et al*.,2015).

Preparation of Grapefruit seed extracts (GSE): 60% grapefruit extract and 40% glycerin) was purchased from Bio/chem. Research (sigma). The GSE was dissolved in distilled water with 0.01% (v/v) to make 1% (v/v) stock solution

All coating treatments were sprayed on the clusters before one day from harvest (9 June). Tween 20, 0.03% (v/v) as an adhesive agent was added to all spraying solutions .

Harvested clusters

The clusters were harvested at maturity stage in 10 June during 2020 and 2021seasons when attained total soluble solids percentage (TSS) in berry juice higher than or equal to 16% and red color according to Ramming and Tarailo (1995).Coating clusters were transported to the laboratory without signs of mechanical damage and deterioration were selected and standardized in clusters showing homogeneous size, color and form, then randomly distributed into 11 groups. Cluster were taken from each replicate of each treatment at the harvest date for determining initial properties (physical and chemical characteristics of berries for each treatment in both seasons.

Storage coating clusters

Treated coated clusters were rapidly carefully were placed in four performed cartoon boxes (30×40×20 cm) for each treatment, as box to determine decay, the second to determine weight loss and the third for determine fruit quality parameters every 1 week during 8 weeks period at different sampling time i.e 0day at harvest,7,14,21,28 ,35and 42,49,56 days of cold storage, each box contained of (2 kg) was replicated three times, and the experiment was repeated twice (2020 and 2021 seasons). Boxes were subjected randomly to one of the following treatments and stored at 0ºC and 90% RH for 6weeks in laboratory of refrigeration of Fruit Handling Department, Horticulture Research Institute, Agriculture Research Center, Giza, Egypt.

Fruit Quality Assessments

Decay percentage: Fruit showed any sign of decay or visual disorders were weighted. The percentage of decay berries were calculated on the bases of total fruit weight, using the following formula

$$\text{Decay \%} = \frac{\text{weight decayed berries (g.)}}{\text{initial weight (g.)}} \times 100$$

Adherence strength (g): Berry adherence force measured by using scale and force meter Shatilon's instrument.

Total soluble solids (TSS ° Brix**)** of the berries was determined using a digital refractometer (Model PR-32, Atago, Japan) by squeezing the juice.

Total acidity (TA) % was determined by titration with a standard solution of sodium hydroxide (0.1N), using phenolphthalein as an indicator (A.O.A.C., 2010). The results were expressed as percentages of anhydrous tartaric acid according to the following equation.

$$\text{Total acidity} = \frac{\text{M1 of NaOH x 0.0075}}{\text{M1 juice used}} \text{X } 100$$

Total phenols: Phenol extraction was carried out with 80% ethanol and the absorbance was measured at 765 nm by spectrophotometer against a blank as described by (Slinkard and Singleton, 1977). Total phenols was quantified from a calibration curve obtained by measuring the absorbance of known concentrations of gallic acid and the results expressed as mg g–1 FW gallic acid equivalent.

Respiration rate: Individual small clusters for each treatment of each sampling date were weighed and placed in 2 liter jars at 0**º C** cold storage or 10**º** C as marketing life. The jars were sealed for 24 h. with a cap and a rubber septum. The resulting CO_2 samples of the headspace were removed from a septum with a syringe and injected into Servomex Inst. (Model 1450 C-Gas Analyzer) to measure carbon dioxide production. Respiration rate was calculated as (ml CO_2/ kg^{-1}/hr^{-1}) (Lurie and Pesis, 1992).

Marketing life

After storage period, coating cluster of each replicate treatments were kept at (10°C ± 1) for 12 days, 90% RH in Market display refrigerators to simulate the market condition, quality measurements as physiochemical properties of clusters .

Results and Discussion

Effect of coating treatments on fruit quality parameters during cold storage and market life

Decay percentage: Results Table (1&2) clear that decay percentage was increased significantly considerably with prolonged storage period 8 weeks at 0°C and 12 days as market life period at (10°C ± 1) in Market display refrigerators in all coating treatments in both seasons. The all coating treatments significantly reduced the decay of star light grape .The lowest values for decay percentage were obtained as a result of the combination for treating the cluster with Ethanol Propolis Extract 4% +Aloe Vera gel (1:3) ratio with water followed by Ethanol Propolis Extract 4% + Grapefruit Seed extract 1%, Ethanol Propolis Extract 4%+ Alginate2% and Ethanol Propolis Extract 4% alone, followed by Aloe Vera gel (1:3) ratio with water +Grapefruit Seed extract 1% ,Aloe Vera gel (1:3) ratio with water + Alginate2%,Aloe Vera gel (1:3) ratio with water alone followed by Grapefruit Seed extract 1%+ Alginate2%, followed by Grapefruit Seed extract 1% alone and then Alginate2% alone treatments in descending order as, compared with the control treatment which have the highest decay % in both seasons.

The reduction decay percentage in coated clusters with Propolis, Aloe Vera gel ,Grapefruit Seed extract ,Alginate combination between treatments or each treatment alone, could be ascribed to the formation of a film as protective layer on the surface of the berries star light grape as protect from rots and protection form spoilage. Also, these results can be related to the existence of phenolic components in coatings material which have antifungal activity and so extension storage-life of grape. The increase decay in uncoated clusters might be a consequence of the fungal

infection. Similar findings agreement with our results as Propolis has a high antimicrobial and fungicidal effects in controlling pathogenic decay during cold storage period of many fruits as wonderful" pomegranate (Kahramanoˇglu *et al*., 2020) **,** guava fruits (Abd El-Gawad,2021) , "Washington" navel orange (El-Badawy *et al.,* 2012), Star Ruby grapefruit (Ozdemir *et al.,* 2010) and date palm (Sahar *et al*., 2019). Meanwhile, the Aloe vera is contains phenol, saponin, anthraquinones components have anti-bacterial, antiviral and antifungal properties (Ni *et al.,* 2004). Aloe vera natural plant extracts can be applied as edible coatings for prevent decay (Serrano *et al*.,2006) and inhibits the growth of various pathogenic (Ullah *et al* .,2016) and reduce proliferation of microorganisms in fruits including nectarines (Ahmed *et al*., 2009), sweet cherries (Martínez-Romero *et al*., 2006) and Table grape(Valverde *et al*., 2005). The of aloe vera has antifungal activity observed against several pathogenic fungi including *Botrytis cinerea*, main causative agent to decay grapes (De Rodriguez *et al*., 2005). Clusters sprayed 24 h before harvest with the Aloe vera extracts solution and then stored 35 day at 2°C had reduced decay berries compared to the control (Castillo *et al*., 2010). Also, Grapefruit seed extract (GSE) decreased decay grapes and had a direct effect on induction of disease resistance during cold storage and prolong storage life in many fruits as fresh-cut vegetables (Xu *et al*., 2007 , Table grape(Xu *et al*., 2009) , strawberry (Benaruiyeh and Sirchi ,2021).Alginate is a gum produced as sodium alginic acid from marine seaweed and able to create strong gels around the surface of berries and lead to decease decay of clusters starlight grape. Similar results were obtained by (Fan *et al*., 2009) of strawberry, (Chiabrando and Giacalone, 2017&Nair *et al*., 2020) of blueberries as they reported Sodium alginate has been effective on prevent microbial and reduced decay during postharvest storage period. Also, combination between coating treatments may indicate the ability of combination of Propolis and Aloe vera or Propolis and grapefruit seed extracts or Propolis and Alginate forming the double layered membranes by increasing protection effect and reduced damage to clusters for prevent decay and inhibited the fungal decay of star light grapes .Combination of aloe vera at 250 mL L^{-1} and grapefruit seed extracts (GSE) at 0.1% have the potential to control gray mold, caused by *Botrytis cinerea* without causing any injury or harmful effects on bunches of flame grape (Tarabih and EL-Metwally,2020).Combination coating of 2% sodium alginate NaAlg and 1% Grapefruit Seed extract GSE coating for controlling fungal decay in Figs grapes (Aloui *et al*., 2014).

Table (1): Effect of some safe coating treatments on Decay % of Star light Grapes fruits stored at 0±1˚C during 2020 and 2021 seasons.

Treatment	2020 Season								
	Storage Period (weeks)								
	1 st	2 nd	3 rd	4 th	5 th	6 th	7 th	8 th	Mean
(1) Grapefruit Seed extract 4%+ Aloe Vera gel (1:3) ratio with water	0	0	0	1.63	3.66	4.69	6.9	10.06	3.37
(2) Ethanol Propolis Extract 4%+ Grapefruit Seed extract 1%	0.83	0.83	0.83	2	2.89	3.78	4.68	15.01	3.86
(3) Ethanol Propolis Extract 4%+ Alginate 2%	0	0	1.22	3.64	6.42	9.01	11.77	15.67	5.97
(4) Ethanol Propolis Extract 4%	1.07	1.53	2.61	3.84	6.23	7.49	9.6	16.85	6.15
(5) Aloe Vera gel (1:3) ratio with water + Grapefruit Seed extract 1%	1.16	2.6	2.6	4.05	6.79	9.38	12.54	18.85	7.25
(6) Aloe Vera gel (1:3) ratio with water + Alginate 2%	0.61	1.97	4.12	4.45	6.55	10.35	13.06	19.1	7.53
(7) Aloe Vera gel (1:3) ratio with water	0.97	0.97	1.96	5.39	8.83	12.1	15.21	20.01	8.18
(8) Alginate 2% + Grapefruit Seed extract 1%	1.12	4.31	4.96	7.15	10.15	13.31	16.62	23.98	10.20
(9) Grapefruit Seed extract 1%	1.59	4.74	5.96	8.28	11.46	14.87	18.05	24.06	11.13
(10) Alginate 2%	2.06	5.16	6.95	9.41	12.77	16.43	19.48	24.23	12.06
(11) control	2.17	7.14	12.87	16.21	20.21	24.41	29.39	36.17	18.57
Mean	1.05	2.66	4.01	6.00	8.72	11.44	14.30	20.36	
LSD value at 0.05	Treatments(T): 0.055			Storage period (p): 0.047				Interaction (T×P): 0.152	

Treatment	2021 Season								
	Storage Period (weeks)								
	1 st	2 nd	3 rd	4 th	5 th	6 th	7 th	8 th	Mean
(1) Grapefruit Seed extract 4%+ Aloe Vera gel (1:3) ratio with water	0	0	0	1.73	3.63	4.92	7.01	8.48	3.22
(2) Ethanol Propolis Extract 4%+ Grapefruit Seed extract 1%	0.42	1.06	1.06	1.22	3.69	6.36	8.35	11.17	4.17
(3) Ethanol Propolis Extract 4%+ Alginate 2%	0	0	0.77	1.86	3.91	6.34	8.43	12.19	4.19
(4) Ethanol Propolis Extract 4%	0.68	0.68	3.17	3.17	5.82	7.51	9.84	12.8	5.46
(5) Aloe Vera gel (1:3) ratio with water + Grapefruit Seed extract 1%	0	0	0	3.14	5.3	8.9	12.09	16.88	5.79
(6) Aloe Vera gel (1:3) ratio with water + Alginate 2%	0	0	5.29	6.71	8.54	10.09	11.25	17.06	7.37
(7) Aloe Vera gel (1:3) ratio with water	1.03	1.94	3.23	5.94	8.75	10.58	13.06	17.19	7.72
(8) Alginate 2% + Grapefruit Seed extract 1%	0	0	0.73	4.96	9.64	13.42	17.12	22.14	8.50
(9) Grapefruit Seed extract 1%	0	1.09	2.02	5.5	9.64	13.75	17.12	22.64	8.97
(10) Alginate 2%	0	2.17	3.31	6.04	9.64	14.09	17.12	23.14	9.44
(11) control	2.34	7.14	11.21	14.14	18.87	24.27	29.79	35.81	17.95
Mean	0.41	1.28	2.80	4.95	7.95	10.93	13.74	18.14	
LSD value at 0.05	Treatments(T): 0.052			Storage period (p): 0.044				Interaction (T×P): 0.147	

Table (2): Effect of some safe coating treatments on Decay % of Star light Grapes fruits stored at 10±1˚C (marketing life) during 2020 and 2021 Seasons.

Treatment	Season 2022				
	Storage Period (days)				
	3	6	9	12	Mean
(1) Grapefruit Seed extract 4%+ Aloe Vera gel (1:3) ratio with water	3.83	8.76	14.56	21.4	12.14
(2) Ethanol Propolis Extract 4%+ Grapefruit Seed extract 1%	4.47	8.33	17.35	22.3	13.11
(3) Ethanol Propolis Extract 4%+ Alginate 2%	4.51	9.52	16.17	25.91	14.03
(4) Ethanol Propolis Extract 4%	4.43	8.99	18.31	25.71	14.36
(5) Aloe Vera gel (1:3) ratio with water + Grapefruit Seed extract 1%	4.21	9.65	19.6	26.55	15.00
(6) Aloe Vera gel (1:3) ratio with water + Alginate 2%	4.57	9.93	19.35	26.17	15.01
(7) Aloe Vera gel (1:3) ratio with water	4.76	9.89	20.51	27.3	15.62
(8) Alginate 2% + Grapefruit Seed extract 1%	5.19	12.56	25.15	27.71	17.65
(9) Grapefruit Seed extract 1%	6.72	11.25	25.48	28.3	17.94
(10) Alginate 2%	6.66	13.87	24.73	27.4	18.17
(11) control	8.77	28.31	37.4	46.3	30.20
Mean	5.28	11.91	18.29	23.52	
LSD value at 0.05	Treatments (T): 0.811	Storage period (p): 0.489		Interaction (T×P): 1.62	

Treatment	Season 2021				
	Storage Period (days)				
	3	6	9	12	Mean
(1) Grapefruit Seed extract 4%+ Aloe Vera gel (1:3) ratio with water	3.72	8.16	13.36	21.4	11.66
(2) Ethanol Propolis Extract 4%+ Grapefruit Seed extract 1%	4.13	8.14	16.21	25.41	13.47
(3) Ethanol Propolis Extract 4%+ Alginate 2%	4.4	9.21	15.19	25.21	13.50
(4) Ethanol Propolis Extract 4%	4.17	8.99	17.85	23.3	13.58
(5) Aloe Vera gel (1:3) ratio with water + Grapefruit Seed extract 1%	4.37	8.73	18.45	26.17	14.43
(6) Aloe Vera gel (1:3) ratio with water + Alginate 2%	4.21	8.85	19.11	26.55	14.68
(7) Aloe Vera gel (1:3) ratio with water	4.76	9.32	19.08	27.3	15.12
(8) Alginate 2% + Grapefruit Seed extract 1%	5.19	11.53	24.28	27.71	17.18
(9) Grapefruit Seed extract 1%	5.82	10.45	24.18	28.3	17.19
(10) Alginate 2%	5.63	13.23	23.83	27.4	17.52
(11) control	7.17	26.71	36	45.1	28.75
Mean	4.87	11.21	20.69	27.62	
LSD value at 0.05	Treatments(T): 0.81	Storage period (p):0.501		Interaction (T×P):1.67	

ISSN 2063-5346 *Section A-Research paper*

Adherence Strength: Berry adherence of Star light Seedless grape cv. during cold storage at 0 °C and 90 - 95% RH in market life period at (10°C ± 1) for 12 days, in Market display refrigerators decreased towards the end of storage period. Figs (1&2&3&4).Furthermore, Treatment of combination with Ethanol Propolis Extract 4% Followed by Treatment of Ethanol Propolis Extract 4% alone treatment gave the highest significant berry adherence as compared with the control in both seasons.

The highest berry adherence strength was obtained by all coating treatments as the beneficial effect of coating applied through penetration and absorption take place through the thin exocarp of the berries and via bunch stems, which enhances infiltration of applied coating so gave the increment of berries adherence to clusters star light .Furthermore, The good film forming by coating material Propolis , Aloe vera , Grape fruit seed Extract ,Sodium Alginate ,each alone or combination between them might cause gave thickening and hardening of the pedicel and protect of an abscission layer and so, increasing in berry adherence strength in treated clusters of star light in contrast to un treated clusters (control). Also , decreased susceptibility to infection by fungal pathogens by propolis or Aloe Vera or Grape fruit extract or Alginate are attributed probably to the increased resistance of tissues to the rots and then maintain strength attachment and delay ripening and senescence in star light grapes contrast to un treated clusters which associated with increased infection by rots that decreased resistance of tissues and causes reduce berry adherence .These results confirmed by (Tarabih and -Metwally,2020) as reported that combination of aloe vera at 250 mL L^{-1} and grapefruit seed extracts (GSE) at 0.1%of flame grape reduced berry attach for 40 days at 0°C±1 with 90 -95% R.H

Fig. (1): Effect of some safe coating treatments on Adherence Strength (g) of Star light Grapes fruits stored at 0±1˚C during 2020 seasons.

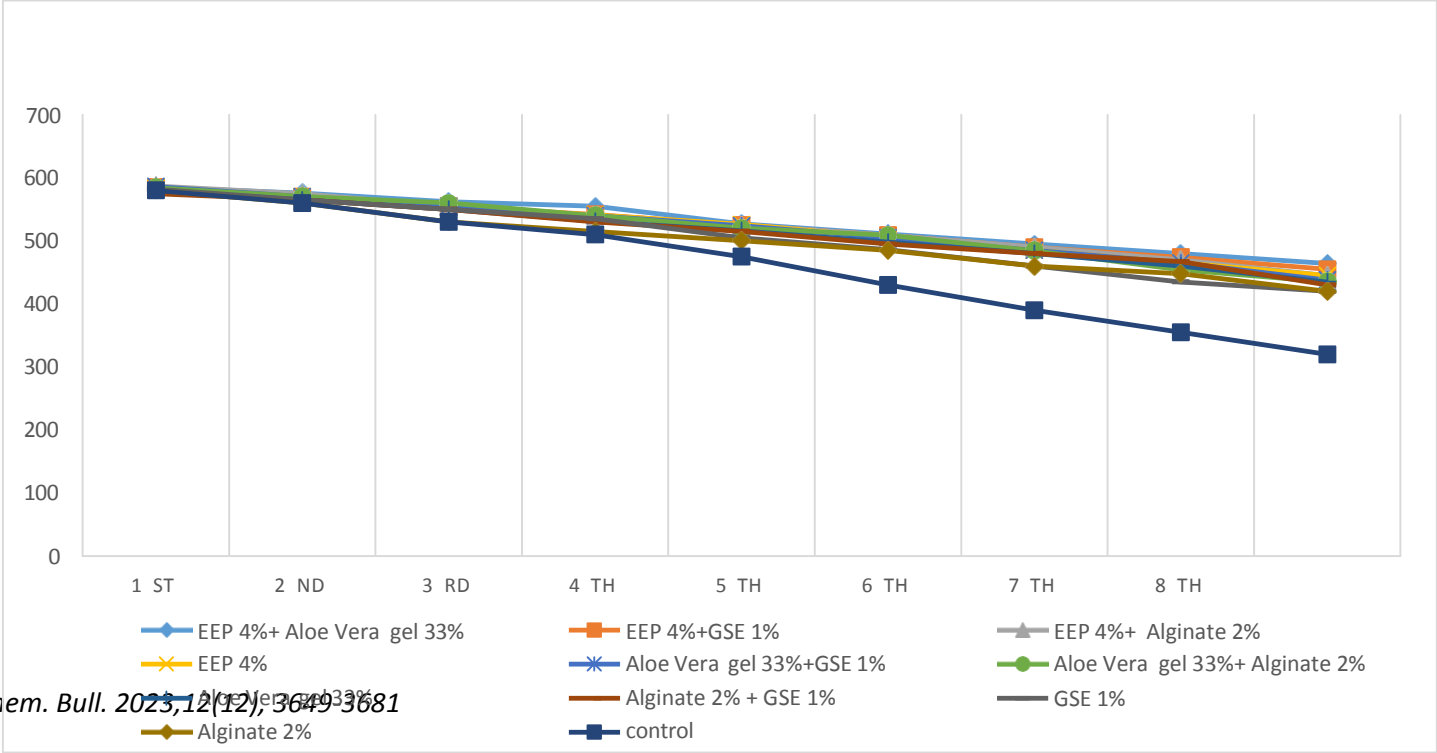

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Fig. (2): Effect of some safe coating treatments on Adherence Strength (g) of Star light Grapes fruits stored at 0±1˚C during 2021 season.

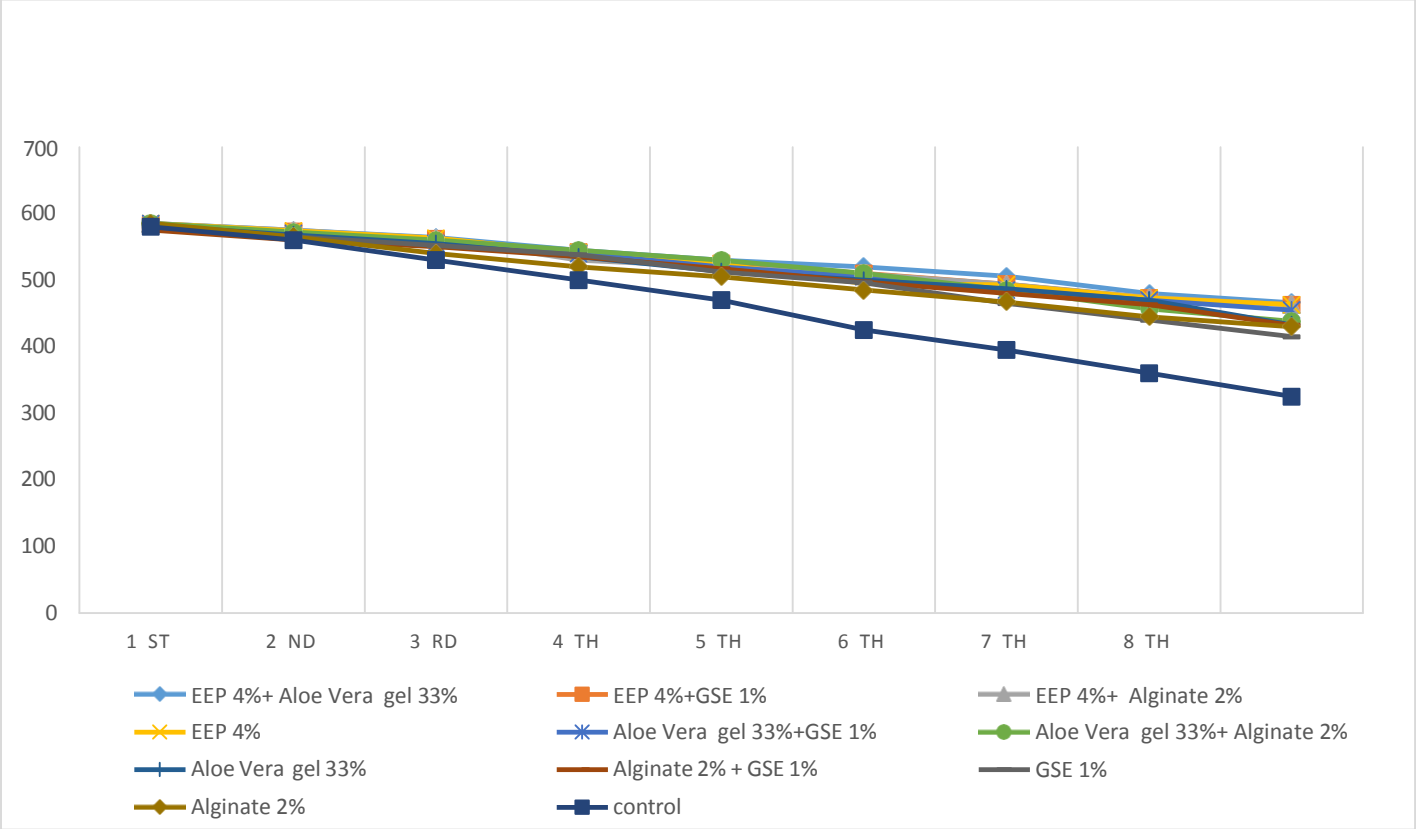

Fig. (3): Effect of some safe coating treatments on Adherence Strength (g) of Star light Grapes fruits stored at 10±1˚C (marketing life) during 2020 season.

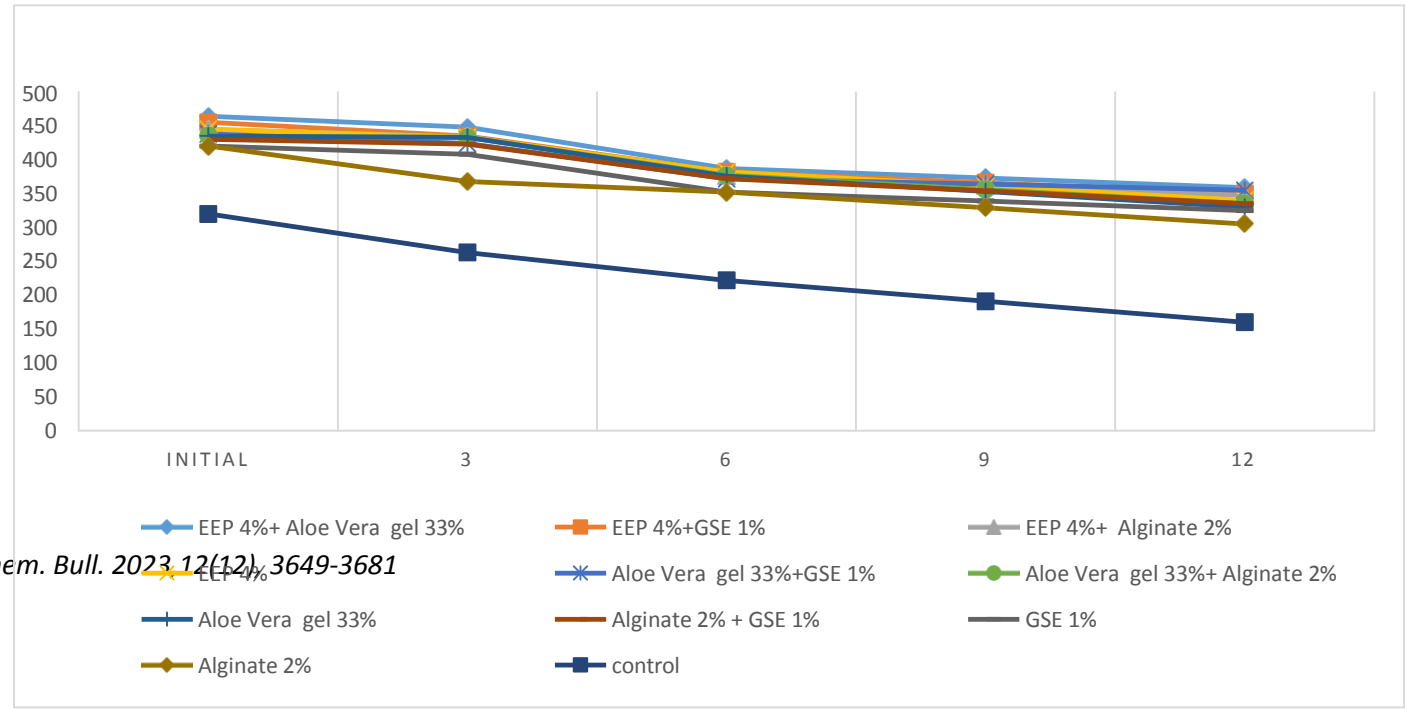

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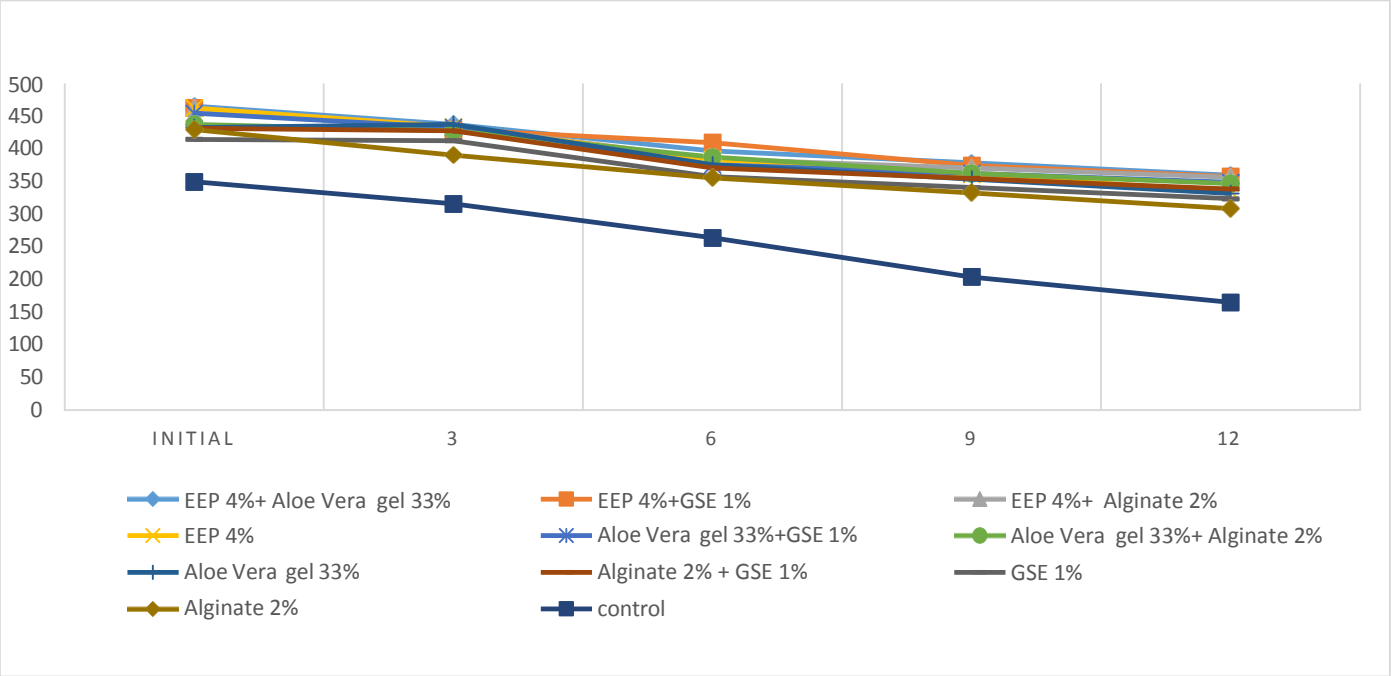
Fig. (4): Effect of some safe coating treatments on Adherence Strength (g) of Star light Grapes fruits stored at 10±1˚C (marketing life) during 2021 season.



Respiration Rate: It can be seen from (Figs 5 &6&7&8) that there was a noticeable decrease in values of rate of respiration at end cold storage period (8weeks) and market period (12 days) after cold storage and market period in all coating treatments during the two seasons of investigation. All coating treatments especially Ethanol Propolis Extract 4% + Aloe Vera gel (1:3) ratio with water followed by Ethanol Propolis Extract 4% +Grapefruit Seed extract 1% and then Ethanol Propolis Extract 4%+ Alginate 2% and then Propolis Extract 4% treatments in descending order tended to have the effective role in reducing the rate of respiration of star light grape clusters. Meanwhile, control clusters had the highest respiration rate.

The reduction of respiration rate in coated fruit may be due to the fact that all coating treatments (propolis, Aleo vera gel, grape fruit extract and Alginate) in combination between them or alone could be reduced respiratory exchange occur in treated clusters of star light grapes during storage. Since Figs grape is considered a non-climacteric fruit, the decrease in respiration rate coated clusters might be resulted from formation layer protection from rots, reduced O2 consumption and CO_2 or by forming a semipermeable modifies the levels of endogenous respiratory gases and consequently retarded dehydration, which delays the senescence and

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increase the storage life of grape. The increase in respiration rate in uncoated clusters might be a consequence of the fungal. In fact, the control grape was often associated with a high incidence of decayed berries .Similar results agree with Propolis extract coatings reduced respiration rate of grapes (Ali *et al*., 2015). Moreover, AV gel coatings reduced O_2 consumption and CO_2 production, thereby preventing anaerobic conditions (Benítez, *et al* .,2013). Aleo vera gel coating creates a modified atmosphere of internal gases, which respiration rate in fruits, including nectarines (Ahmed *et al*., 2009), sweet cherries (Martínez-Romero et al., 2006) and Table grape(Valverde *et al*., 2005 & Serrano *et al*.,2006 and Chauhan *et al*., 2014)and mango (Sophia *et al*.,2015) .Similar results have been reported in Grape fruit extract coating lowered the respiration rate of red globe grape (Xu *et al*., 2009).In previous studies, reduction in respiration rate with finding of Alginate of blue berry (Duan, *et al*., 2011), plum (Yousuf, *et al*., 2018& Bal,2019) , pistachio **(**Shakerardekani *et al* ., 2021**)** .

Fig. (5): Effect of some safe coating treatments on Respiration rate (ml co_2/kg/h) % of Star light Grapes fruits stored at 0±1˚C during 2020 season.

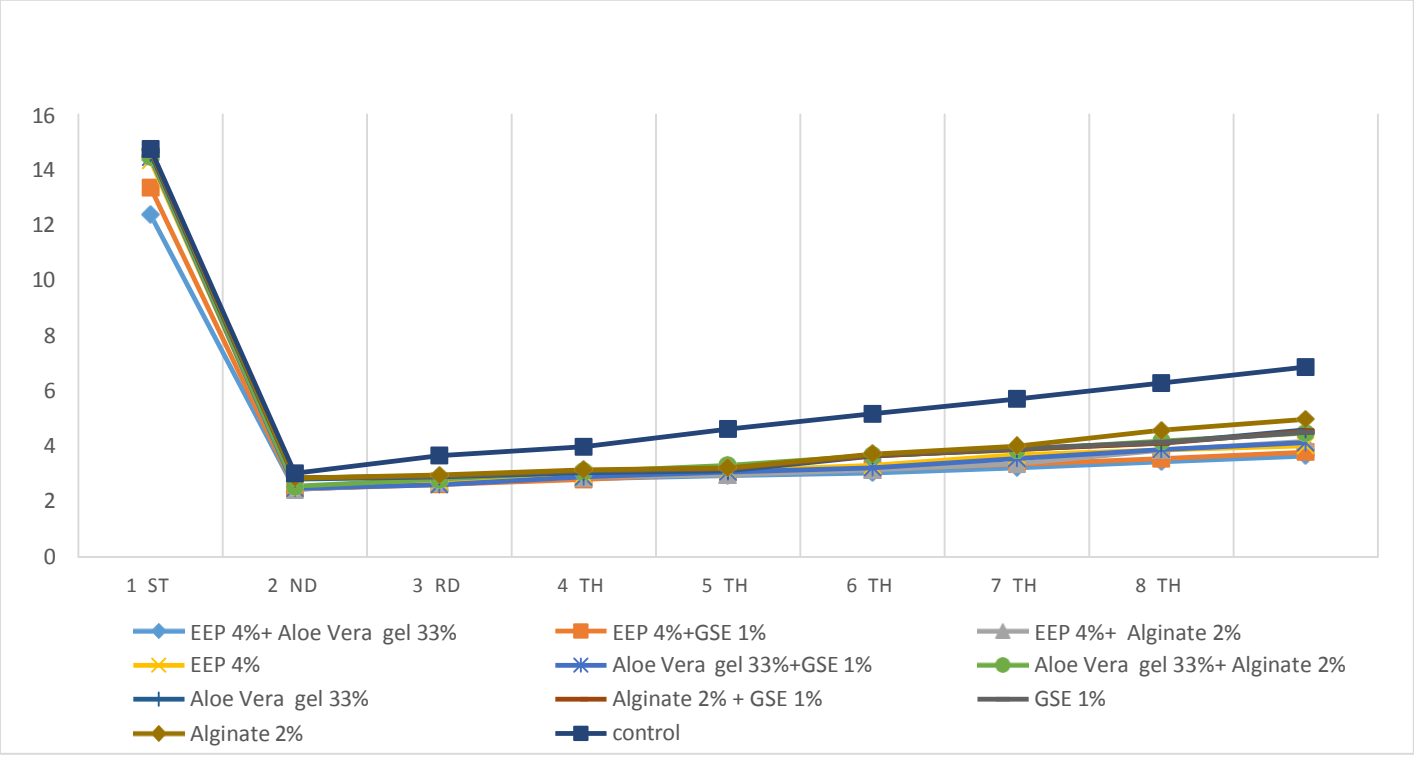

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Fig. (6): Effect of some safe coating treatments on Respiration rate (ml co_2/kg/h) % of Star light Grapes fruits stored at 0±1˚C during 2021 season.

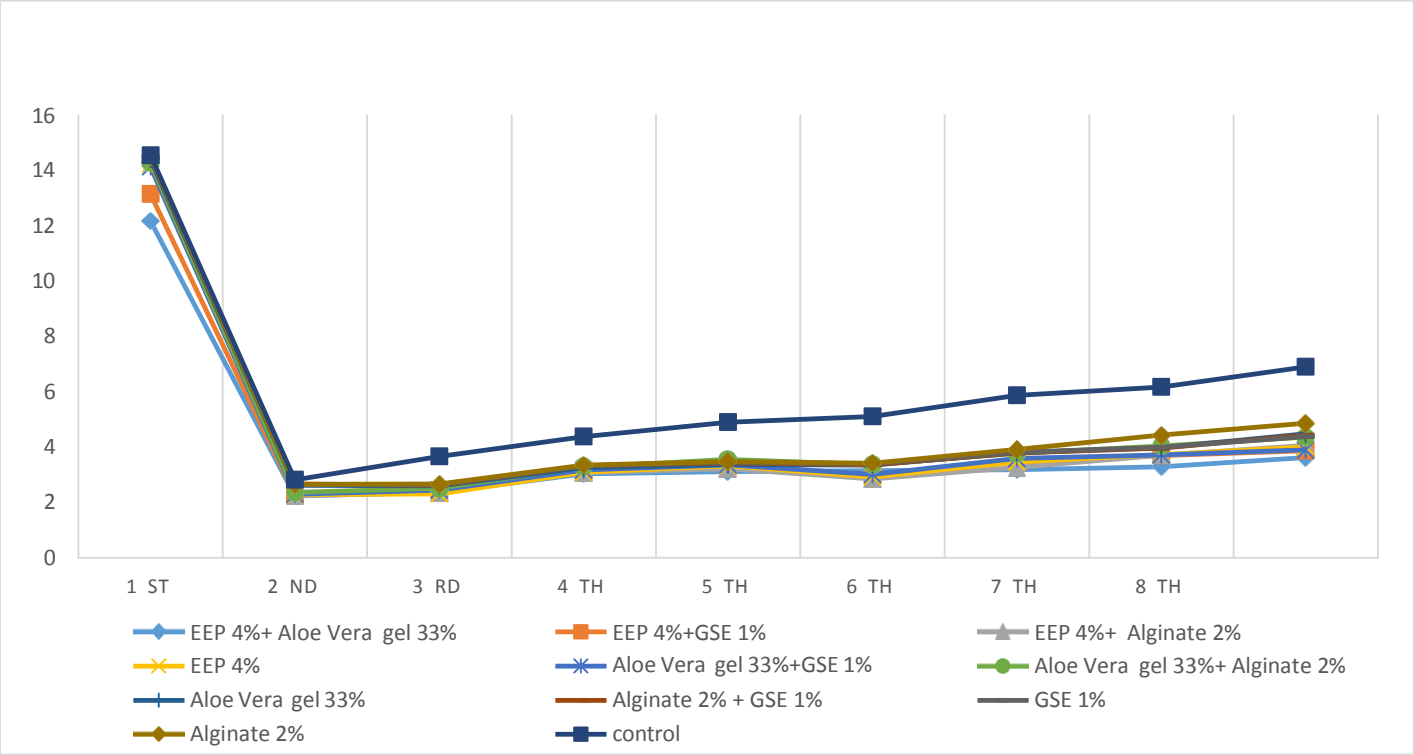

Fig (7): Effect of some safe coating treatments on Respiration rate (ml co_2/kg/h) % of Star light Grapes fruits stored at 10±1˚C (marketing life) during 2020 season.

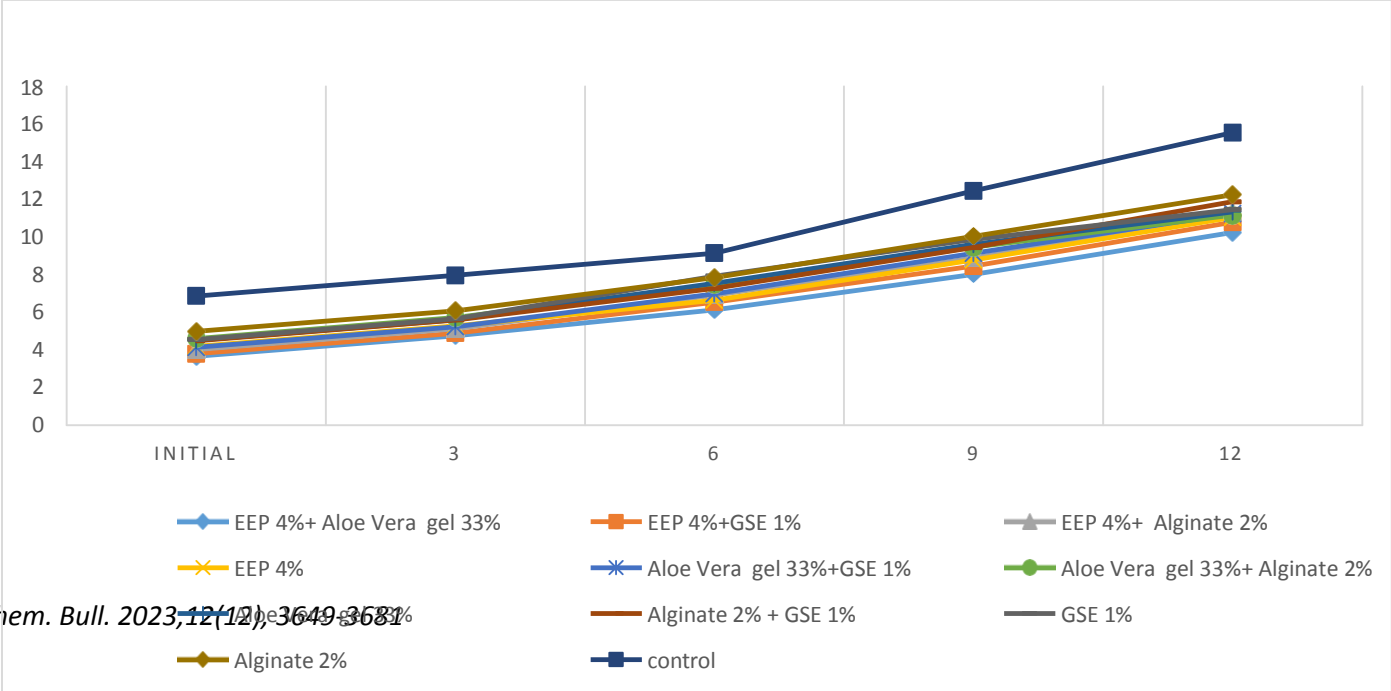

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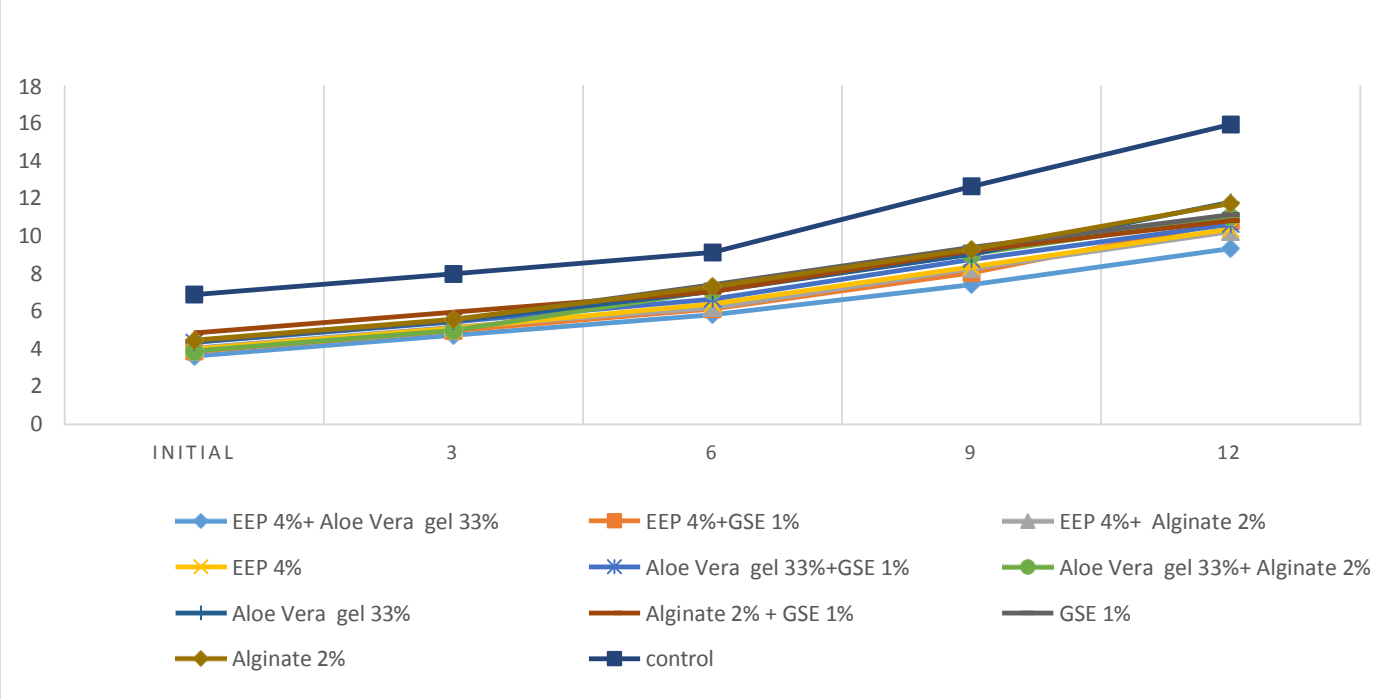
Fig (8): Effect of some safe coating treatments on Respiration rate (ml co_2/kg/h) % of Star light Grapes fruits stored at 10±1˚C (marketing life) during 2021 season.



Total soluble solids (TSS): Total soluble solids content of stored fruits as recorded in Figs (9 & 10&11&12) were gradually and significantly increased with the extend of storage at 0**º C** or market at 10**º C** periods during 2020 & 2021 seasons. Untreated Clusters appeared to an increase in fruit content of TSS % as significant difference between all coating treatments and control treatments. In this respect Treatment of combination with Propolis Followed by Treatment of Propolis alone then Treatment of combination with Aloe Vera gel Followed by Treatment of Aloe alone and then Grapefruit Seed extract + Alginate followed by Grapefruit Seed extract alone and finally Alginate alone treatments gave the lowest increment of TSS as compared with the control treatment .

Delay the increase in concentrations of total soluble solids (TSS) during storage showed in treated clusters with combination of treatments (propolis or Aloe Vera or Grape fruit extract or Alginate) or each treatment alone , this is may be due to slowing down metabolism activity, respiration and delay in the ripening process and senescence by double layer production . The lower TSS due to the slower change from carbohydrates to sugars (Rohani *et al.*, 1997). TSS increased slightly during storage probably due to the water loss, activity of hydrolytic enzymes, or the decrease in respiration rate and conversion of sugars in CO_2 and H_2O during the storage period

(Comabella and. Lara,2013) the use of an edible coating propolis or aloe vera gel or Alginate or as a Grape fruit seeds Extract postharvest treatment exogenously reduce the rates of respiration thus inhibiting ripening related changes within the berries resultinglower degradation of TSS in treated clusters and maintain quality of star light grapes .In contrast uncoated clusters had high metabolism activity, respiration and quick in the ripening process and senescence .Also, The positive influence of coating treatments on the TSS levels could be explained by the similar mechanism of weight loss prevention, which is the formation of a semipermeable and biodegradable barrier around the fruits which suppresses some biochemical reactions, including the most important respiration. In previous studies, reduction in respiration rate of table grape with finding of Propolis extract coatings (Ali *et al*., 2015), Aleo vera gel coating of (Chauhan *et al*., 2014), Grape fruit extract (Xu *et al*., 2009) and Alginate of plum (Bal,2019) . Also, vera at 250 mL L^{-1} or grapefruit seed extracts (GSE) at 0.1% alone or in in Combination between them ,effectively retarded the degradation of TSS of flame grape for 40 days at 0°C±1 with 90-95% R.H.(Tarabih and -Metwally,2020).*Aloe vera* gel coating maintained TSS of strawberry fruits **(** Qamar *et al*., 2018) and alginate (Zam ,2019) of sweet cherries

Total acidity: Data tabulated in Table (3 & 4) showed that total acidity (TA) was significantly decrease with prolonging cold storage or market periods. All coating treatments epically combined treatments of Propolis or Aloe vera or Grape Fruit Seeds Extract or Alginate could be noticed that there was significant differences were observed between them and control treatment, all coatings treatments delayed the decrease of TA .all coating treatments gave the highest values of acidity in the end of cold storage or in market period both seasons.

According to total acidity (TA), It seems that coated clusters with Propolis, Aleo vera, Grape fruit seed Extract Sodium Alginate, each alone or combination between them, gave the highest retention of juice acidity during storage .This could be due to reduction in metabolic changes of organic acid into carbon dioxide and water which resulted in reducing respiration rate and therefore maintain higher rates of acids. The reduction of TA value in the uncoated grapes of the storage time can be as a result of acid oxidation during the Krebs cycle (Benaruiyeh and Sirchi, 2021**)** and the faster reduction in TA values in control clusters may be because increasing the rates of respiration in decayed clusters thus high ripening related changes within the berries resulting high consumption of organic acids, which gives the lowest acidity during storage led to the faster senescence in fruit. Same results were previously found for Propolis treatments showed the highest of TA of straw berry fruits **(yang *et al*., 2016).** *Aloe vera* gel of strawberry fruits **(** Qamar ***et al*., 2018)** Grape Fruit Extract of strawberry (Benaruiyeh and Sirchi ,2021**)**. Alginate gave the high levels of titratable acidity of sweet cherries (TA) (Lim *et al*., 2011 and Zam , 2019). Also, Aleo vera or Grape Fruit Seed Extract alone or in Combination between them of flame grape (Tarabih and -Metwally, 2020).

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Fig (9): Effect of some safe coating treatments on T.S.S (%) of Star light Grapes fruits stored at 0±1˚C during 2020 season.

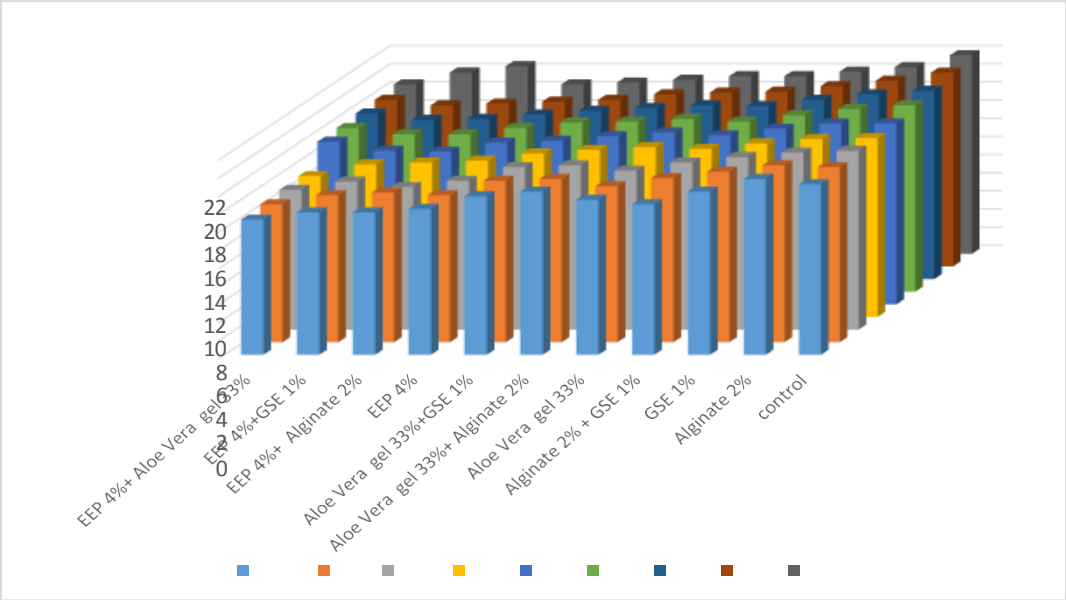

Fig (10): Effect of some safe coating treatments on T.S.S (%) of Star light Grapes fruits stored at 0±1˚C during 2021 season.

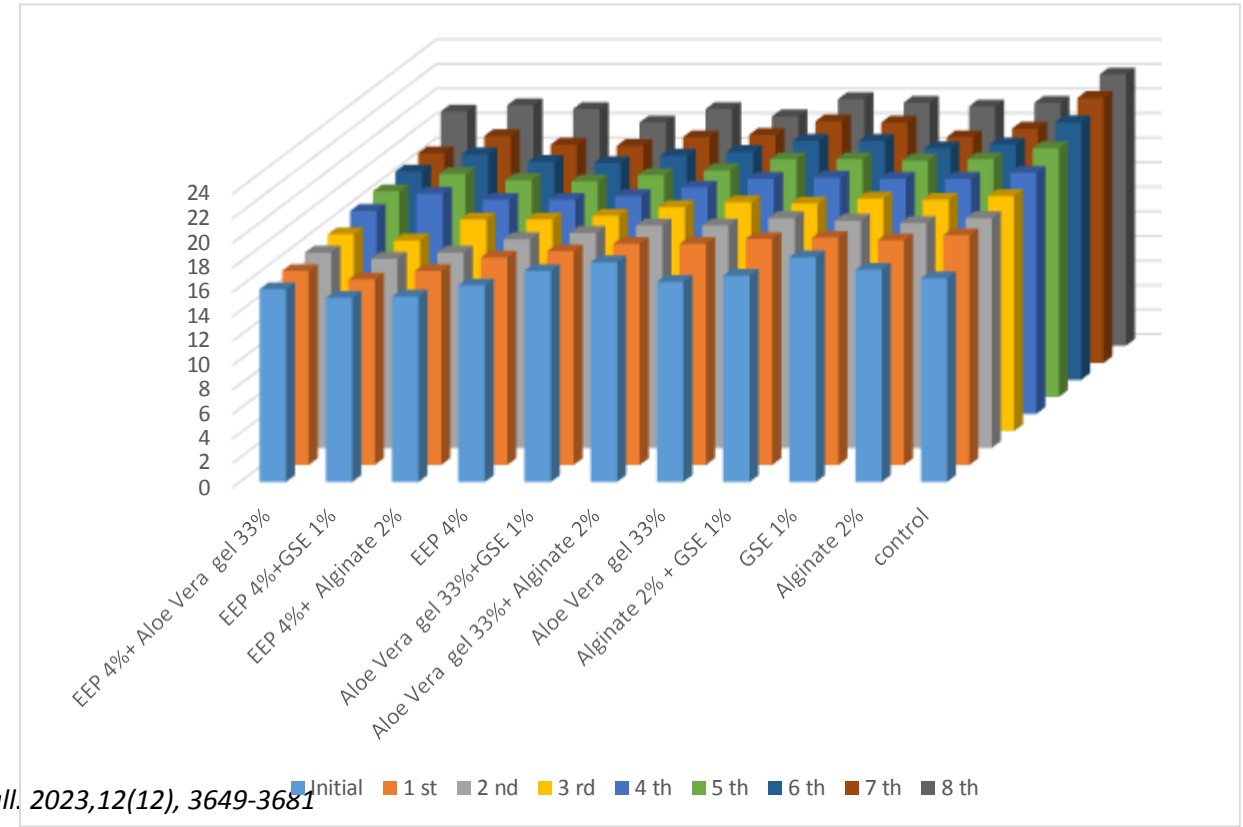

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Fig. (11): Effect of some safe coating treatments on T.S.S (%) (%) of Star light Grapes fruits stored at 10±1˚C (marketing life) during 2020 season.

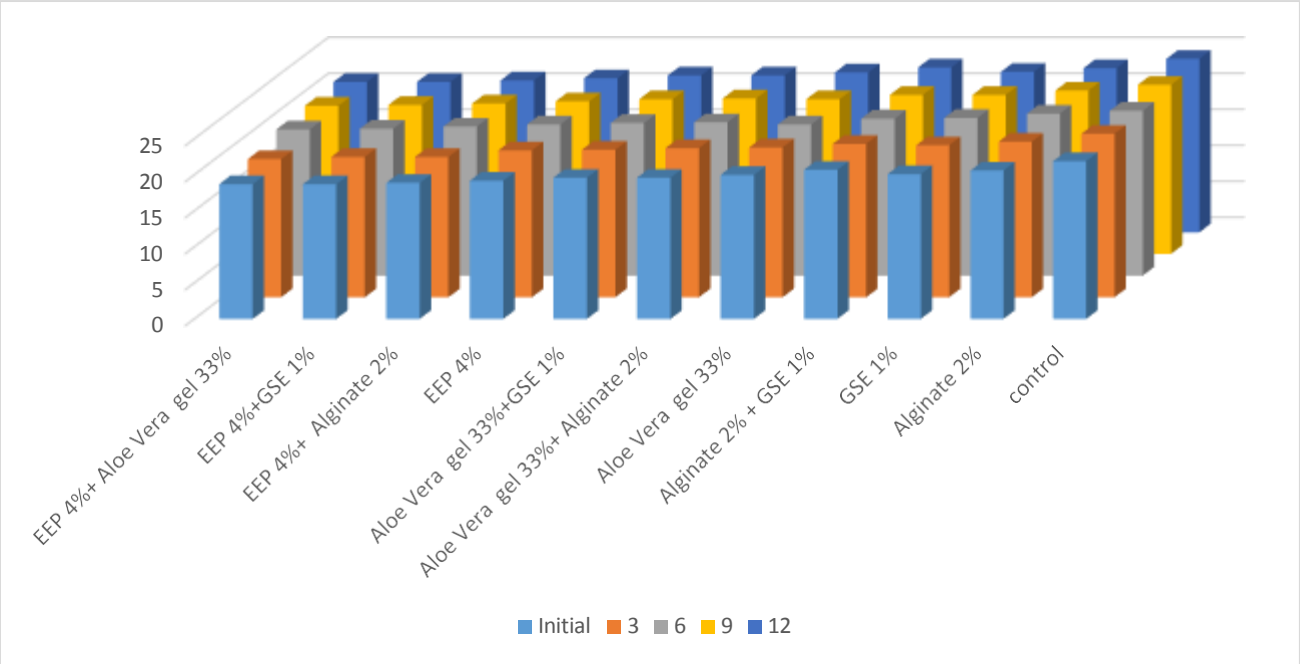

Fig (12): Effect of some safe coating treatments on T.S.S (%) (%) of Star light Grapes fruits stored at 10±1˚C (marketing life) during 2020 season.

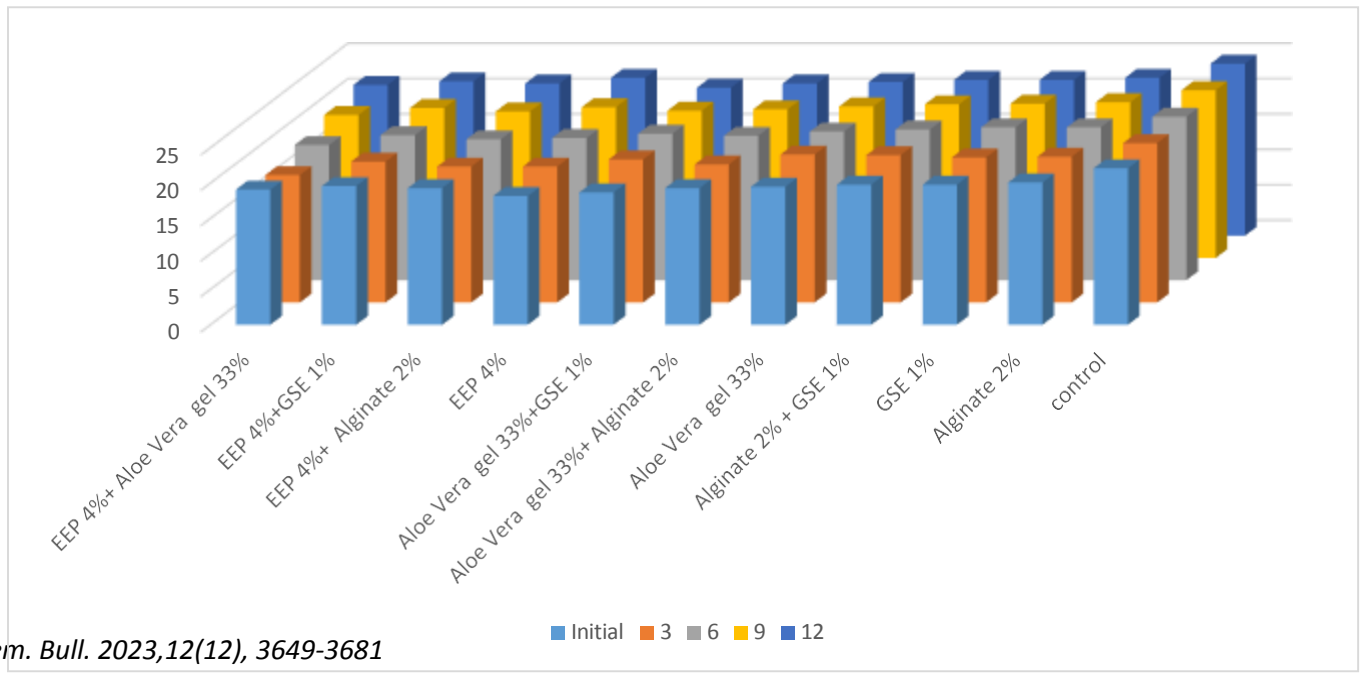

Table (3): Effect of some safe coating treatments on Total acidity (%) of Star light Grapes fruits stored at 0±1˚C during 2020 and 2021 seasons.

Treatment	2020 Season									
	Storage Period (weeks)									
	Initial	1 st	2 nd	3 rd	4 th	5 th	6 th	7 th	8 th	Mean
(1) Grapefruit Seed extract 4%+ Aloe Vera gel (1:3) ratio with water	1.43	1.35	1.28	1.24	1.24	1.2	1.16	1.12	1.06	1.23
(2) Ethanol Propolis Extract 4%+ Grapefruit Seed extract 1%	1.31	1.24	1.2	1.16	1.13	1.09	1.05	1.01	1.01	1.13
(3) Ethanol Propolis Extract 4%+ Alginate 2%	1.23	1.16	1.16	1.13	1.09	1.05	1.03	1.01	0.94	1.09
(4) Ethanol Propolis Extract 4%	1.24	1.24	1.16	1.13	1.05	1.01	1	0.98	0.93	1.08
(5) Aloe Vera gel (1:3) ratio with water + Grapefruit Seed extract 1%	1.2	1.13	1.09	1.09	1.09	1.08	1.03	0.98	0.9	1.07
(6) Aloe Vera gel (1:3) ratio with water + Alginate 2%	1.2	1.18	1.16	1.13	1.05	0.98	0.98	0.98	0.9	1.06
(7) Aloe Vera gel (1:3) ratio with water	1.4	1.3	1.2	1.07	1.03	0.93	0.9	0.87	0.84	1.06
(8) Alginate 2% + Grapefruit Seed extract 1%	1.2	1.16	1.09	1.09	1.01	1.01	0.98	0.94	0.83	1.03
(9) Grapefruit Seed extract 1%	1.22	1.16	1.07	1.035	0.995	0.975	0.94	0.9	0.83	1.01
(10) Alginate 2%	1.24	1.16	1.05	0.98	0.98	0.94	0.9	0.86	0.83	0.99
(11) control	1.2	1.13	1	1	0.8	0.8	0.75	0.7	0.70	0.90
Mean	1.26	1.20	1.13	1.10	1.04	1.01	0.97	0.94	0.89	
LSD value at 0.05	Treatments(T): 0.05			Storage period (p): 0.04				Interaction (T×P): 0.26		

Treatment	2021 Season									
	Storage Period (weeks)									
	Initial	1 st	2 nd	3 rd	4 th	5 th	6 th	7 th	8 th	Mean
(1) Grapefruit Seed extract 4%+ Aloe Vera gel (1:3) ratio with water	1.73	1.39	1.39	1.28	1.24	1.24	1.22	1.2	1.13	1.31
(2) Ethanol Propolis Extract 4%+ Grapefruit Seed extract 1%	1.43	1.31	1.28	1.2	1.2	1.15	1.14	1.13	1.05	1.21
(3) Ethanol Propolis Extract 4%+ Alginate 2%	1.37	1.33	1.3	1.23	1.1	1.07	1.02	0.97	0.95	1.15
(4) Ethanol Propolis Extract 4%	1.28	1.16	1.13	1.13	1.09	1.05	1.05	1.05	0.95	1.10
(5) Aloe Vera gel (1:3) ratio with water + Grapefruit Seed extract 1%	1.28	1.2	1.13	1.09	1.09	1.09	1.07	1.05	0.92	1.10
(6) Aloe Vera gel (1:3) ratio with water + Alginate 2%	1.24	1.16	1.16	1.13	1.13	1.05	1.03	1.01	0.86	1.09
(7) Aloe Vera gel (1:3) ratio with water	1.24	1.16	1.09	1.09	1.01	1.01	0.96	0.9	0.86	1.04
(8) Alginate 2% + Grapefruit Seed extract 1%	1.2	1.125	1.1	1.05	1.05	1.01	0.99	0.97	0.85	1.04
(9) Grapefruit Seed extract 1%	1.24	1.16	1.09	1.01	1.01	0.97	0.93	0.89	0.83	1.01
(10) Alginate 2%	1.16	1.09	1.05	0.98	0.98	0.98	0.96	0.92	0.84	1.00
(11) control	1.3	1.2	1.06	0.97	0.92	0.85	0.8	0.75	0.69	0.95
Mean	1.32	1.21	1.16	1.11	1.07	1.04	1.02	0.99	0.90	
LSD value at 0.05	Treatments(T):0.05			Storage period (p): 0.04				Interaction (T×P):0.25		

Table (4): Effect of some safe coating treatments on Total acidity (%) of Star light Grapes fruits stored at 10±1˚C (marketing life) during 2020 and 2021 seasons.

Treatment	Season 2020					
	Storage Period (days)					
	Initial	3	6	9	12	Mean
(1) Grapefruit Seed extract 4%+ Aloe Vera gel (1:3) ratio with water	0.94	0.84	0.76	0.70	0.54	0.76
(2) Ethanol Propolis Extract 4%+ Grapefruit Seed extract 1%	1.01	0.76	0.65	0.60	0.61	0.73
(3) Ethanol Propolis Extract 4%+ Alginate 2%	0.94	0.73	0.63	0.60	0.54	0.69
(4) Ethanol Propolis Extract 4%	0.90	0.73	0.58	0.50	0.50	0.64
(5) Aloe Vera gel (1:3) ratio with water + Grapefruit Seed extract 1%	0.86	0.69	0.63	0.50	0.46	0.63
(6) Aloe Vera gel (1:3) ratio with water + Alginate 2%	0.83	0.73	0.60	0.50	0.43	0.62
(7) Aloe Vera gel (1:3) ratio with water	0.83	0.69	0.58	0.50	0.43	0.61
(8) Alginate 2% + Grapefruit Seed extract 1%	0.83	0.64	0.54	0.50	0.43	0.59
(9) Grapefruit Seed extract 1%	0.83	0.58	0.50	0.50	0.43	0.57
(10) Alginate 2%	0.73	0.67	0.50	0.40	0.33	0.53
(11) control	0.70	0.60	0.35	0.30	0.30	0.45
Mean	0.85	0.70	0.57	0.51	0.45	
LSD value at 0.05	Treatments(T):0.07		Storage period (p):0.05		Interaction (T×P):0.26	

Treatment	Season 2021					
	Storage Period (days)					
	Initial	3	6	9	12	Mean
(1) Grapefruit Seed extract 4%+ Aloe Vera gel (1:3) ratio with water	1.13	0.88	0.82	0.78	0.73	0.87
(2) Ethanol Propolis Extract 4%+ Grapefruit Seed extract 1%	1.05	0.80	0.74	0.70	0.65	0.79
(3) Ethanol Propolis Extract 4%+ Alginate 2%	1.01	0.73	0.65	0.63	0.61	0.73
(4) Ethanol Propolis Extract 4%	0.94	0.73	0.63	0.59	0.54	0.69
(5) Aloe Vera gel (1:3) ratio with water + Grapefruit Seed extract 1%	0.98	0.69	0.60	0.59	0.58	0.69
(6) Aloe Vera gel (1:3) ratio with water + Alginate 2%	0.9	0.83	0.62	0.56	0.50	0.68
(7) Aloe Vera gel (1:3) ratio with water	0.86	0.69	0.67	0.57	0.46	0.65
(8) Alginate 2% + Grapefruit Seed extract 1%	0.845	0.66	0.60	0.52	0.45	0.62
(9) Grapefruit Seed extract 1%	0.86	0.61	0.60	0.53	0.46	0.61
(10) Alginate 2%	0.75	0.58	0.56	0.46	0.35	0.54
(11) control	0.75	0.60	0.46	0.41	0.35	0.51
Mean	0.92	0.71	0.63	0.58	0.52	
LSD value at 0.05	Treatments(T):0.07		Storage period (p):0.05		Interaction (T×P):0.26	

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Total phenols: Results illustrated in Figs (13&14&15&16) showed that there was significant decrease in total phenols content as the storage period prolonged. Moreover, the present data reveal that the highest values of total phenols were recorded for Star Light grape clusters treated with coating treatments Treatment of combination with Ethanol Propolis Extract 4% Followed by Treatment of Ethanol Propolis Extract 4% alone then Treatment of combination with Aloe Vera gel (1:3) ratio with water Followed by Treatment of Aloe Vera gel (1:3) ratio with water alone and then Grapefruit Seed extract 1%+ Alginate2% followed by Grapefruit Seed extract 1% alone and then Alginate2%alone treatments in descending order compared with untreated clusters which had the lowest significant means of total phenols at the end of storage period in both seasons of study.

The maximum retention in phenolic compounds can be inferred by the reduced respiration. all coating treatments gave the lowest decrease in total phenols compared with the control fruits Furthermore, coating treatments especially propolis or Aloe vera or Grape Fruit seeds Extract or Alginate treatments decreased losses total phenols that may be due to delay oxidation of phenol substances through Polyphenol oxidase (PPO) activity(Yamaguchi *et al*., 2003) , also, probably due to lower permeability of oxygen and thereby lower activity of enzymes .this could be attributed to its ability to decrease oxidative stress (ripening) as total phenols in grapes play important role in antioxidant activities (Kosanić *et al*. 2011) and then leading to improve storability and market life of starlight Figs grapes. These results can be related to the existence of phenolic components in coatings (Gebel and Magurno, 2014). All coating treatments contain a lot of phenols compounds as can retarded the senescence of Figs grape , However, coated treated grapes showed dramatically higher total phenolics content as the suppression of PPO activity by membrane formation of the berries star light grapes .The phenolic compounds may help to protect cells against the oxidative damages caused by scavenging free radicals (Chun *et a*l., 2003).These results are in harmony with those obtained by (Martinez- Romero *et al*., 2006; Marpudi *et al*., 2011) as Aloe Vera gel coating caused delay oxidative browning and prolong the shelf life in sweet cherry and papaya fruits. The inhibition of PPO activity and increased total phenolics content by Grape Fruit seeds Extract of grape during cold storage (Xu *et al*., 2009). Increase in the phenolic content in the strawberries coated with cassava starch combined propolis, since it is rich in these compounds (Teixeira *et al*., 2010). In confirmation of this knowledge, numerous studies reported success about the preventive characteristics of propolis for the total phenols, such as It was noted that propolis treatment prevents the degradation of the phenolic compounds at mango (Al-Qurashi and Awad ,2018)and dragon fruits (Zahid *et al*., 2013). Aloe vera treatments delayed the loss of phenolic compounds of flame seedless grape during cold storage (Qamar *et al*., 2018& sahar *et al*., 2019 ,Tarabih and -Metwally,2020). Sodium Aliginate coated sweet cherries observed maximum retention of phenolic compounds during cold storage (Zam, 2019). Alginate coatings proved to be an effective postharvest treatment to enhance the polyphenol content of blueberry fruits. (Nair *et al*., 2020). Grape Fruit Extract maintenance of total phenolic contents during cold storage at 4°C. and prolong storage life of strawberry (Benaruiyeh and Sirchi ,2021).Generally, edible coatings can prolong post-harvest grapes life through reducing respiration and oxidative reaction rates **(** Petriccione *et al*.,2015**)** .

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Fig. (13): Effect of some safe coating treatments on Total phenols (mg/100g F.W) of Star light Grapes fruits stored at 0±1˚C (marketing life) during 2020 season.

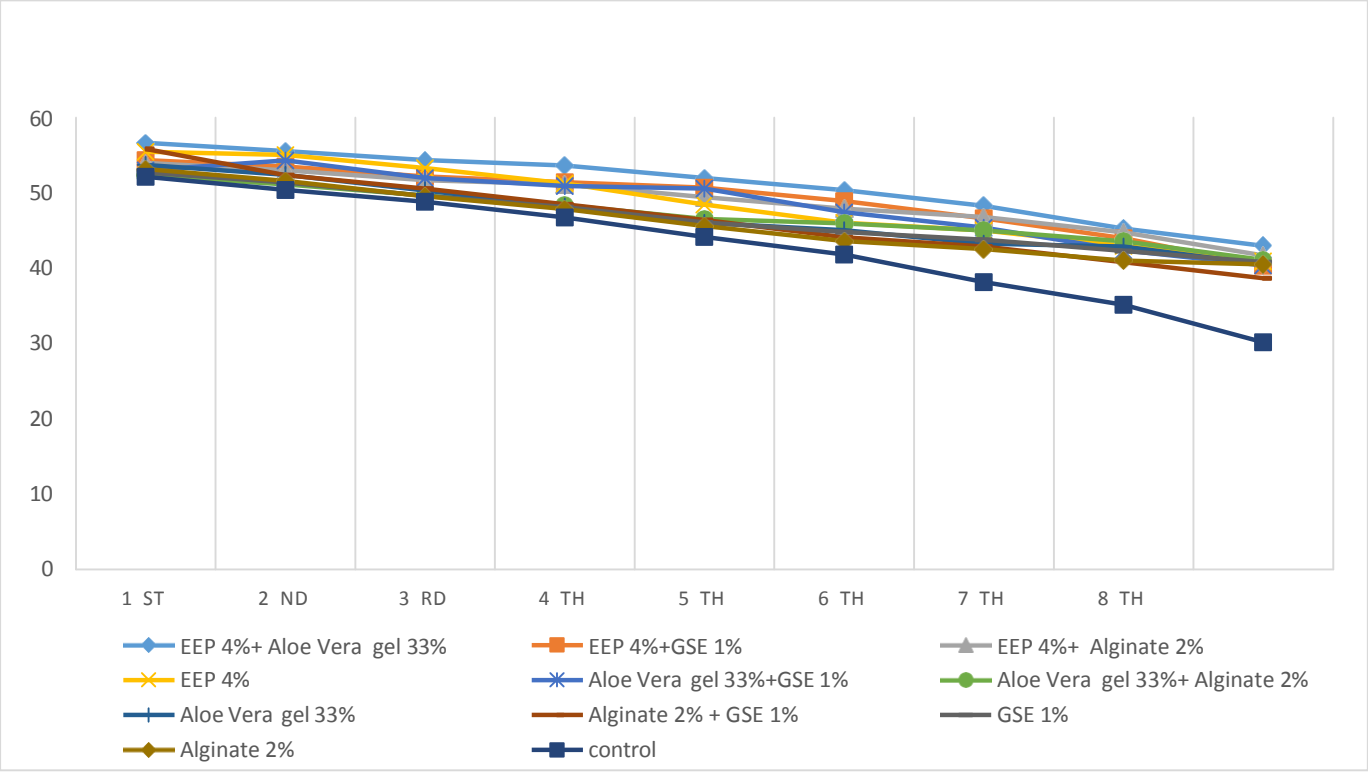

Fig. (14): Effect of some safe coating treatments on Total phenols (mg/100g F.W) of Star light Grapes fruits stored at 0±1˚C (marketing life) during 2021 season.

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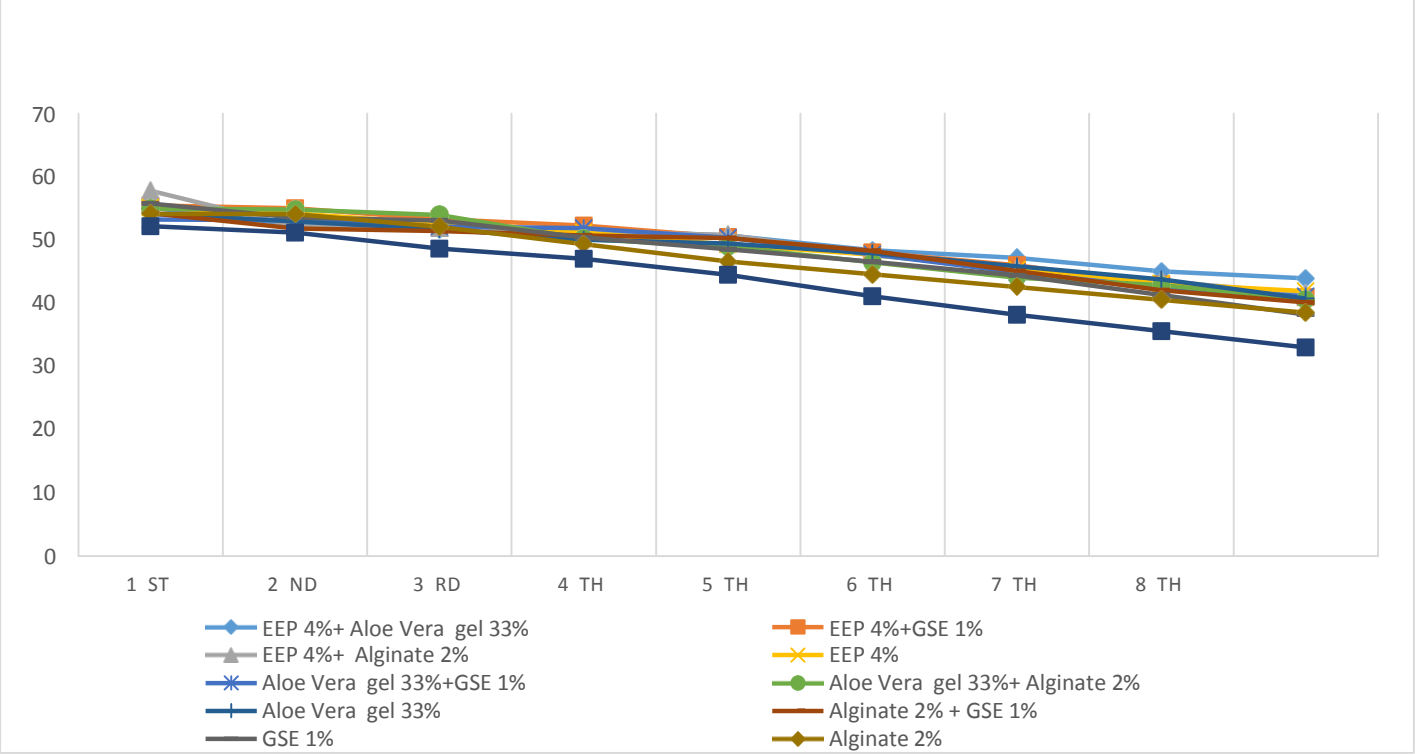

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Fig. (15): Effect of some safe coating treatments on Total phenols (mg/100g F.W) of Star light Grapes fruits stored at 10±1˚C (marketing life) during 2020 season.

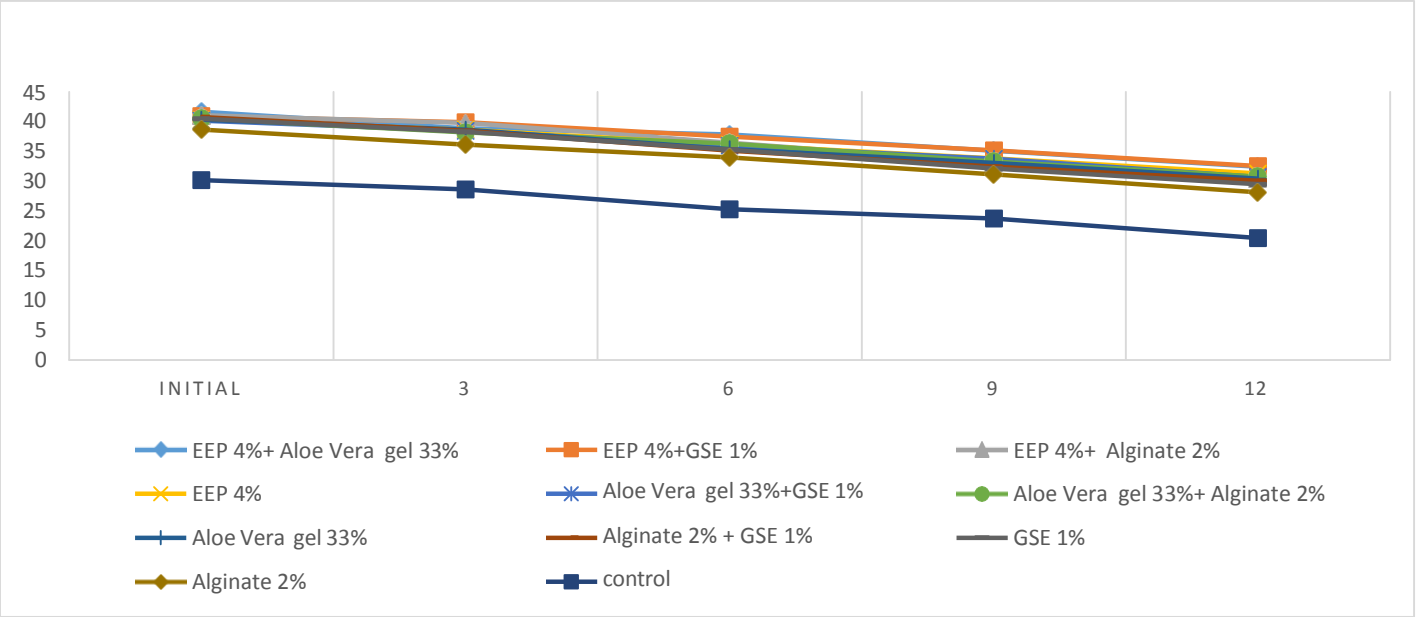
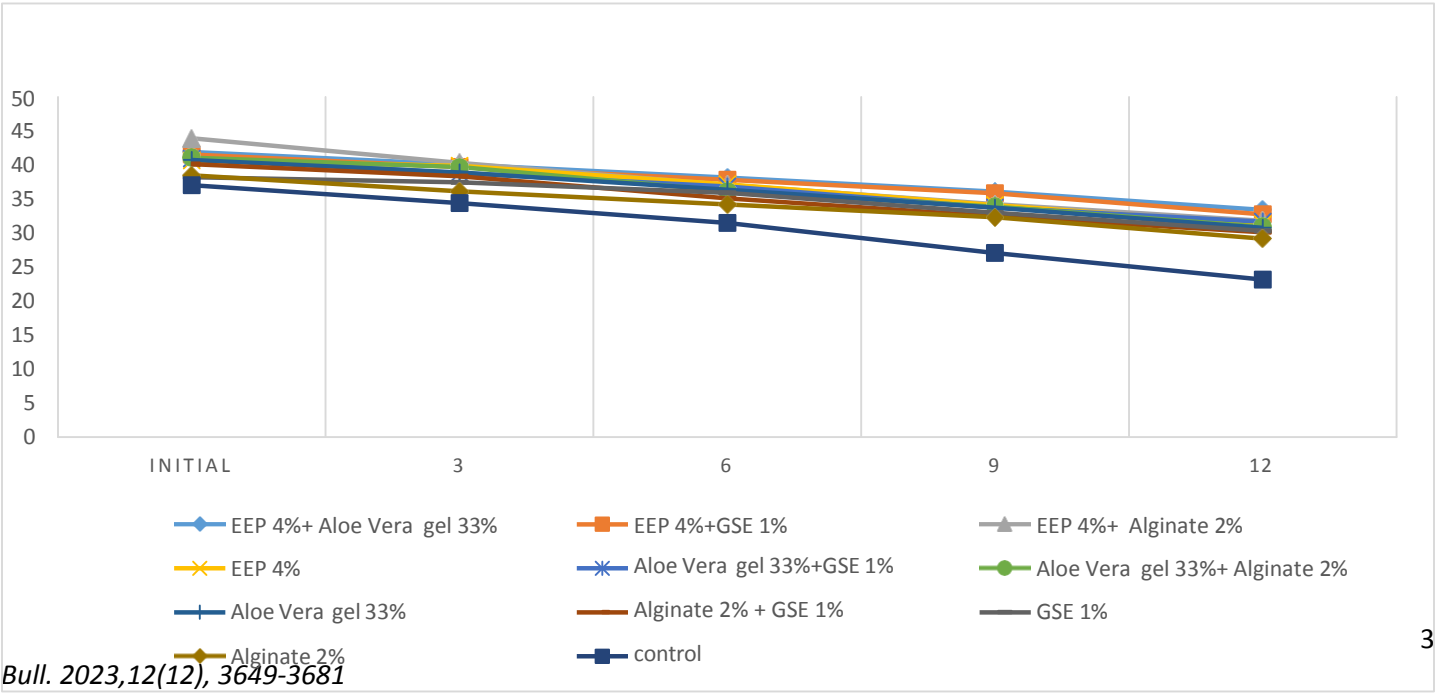


Fig. (16): Effect of some safe coating treatments on Total phenols (mg/100g F.W) of Star light Grapes fruits stored at 10±1˚C (marketing life) during 2021 season.



Total sugars: It clearly that total soluble sugars in Figs (15 & 16) increased gradually and significantly with extending of storage or market periods. However, control treatment resulted in higher and faster increase in total sugars during cold storage than that occurred in fruits treated with coating treatments at the two seasons of this study. In this respect Ethanol Propolis Extract 4% +Aloe Vera gel (1:3) ratio with water followed by Ethanol Propolis Extract 4% + Grapefruit Seed extract 1%, Ethanol Propolis Extract 4%+ Alginate2% and Ethanol Propolis Extract 4% alone, followed by Aloe Vera gel (1:3) ratio with water +Grapefruit Seed extract 1% ,Aloe Vera gel (1:3) ratio with water + Alginate2%,Aloe Vera gel (1:3) ratio with water alone followed by Grapefruit Seed extract 1%+ Alginate2%, followed by Grapefruit Seed extract 1% alone and then Alginate2% alone treatments in descending order gave the lowest values of total sugars as compared with the control treatment for both investigate seasons .

The post- harvest treatments of propolis, Aloe Vera gel additional or grape Fruit seeds Extract or Alginate maintained the increment total sugars content by increasing during cold storage related with slow respiration and delay accumulation of sugars and starch degradation in fruits and delay in physiological ageing and alteration in metabolism, which ultimately lowest increment in sugars and then delayed ripening (Du *et al*., 1997) as Aloe Vera gel reduces a-galactosidase and polygalacturonate activities in the fruit (Nunan *et al*. ,1998) and so all coating treatments delayed the quick entry in Fruit aging stage so, maintained on total sugars and then leading to extend the storability life of star light Table grape . Similar results have been reported in coating with Propolis of grapes (Candir *et al*.,2006)& date palm (Sahar *et al*., 2019) ,Aloe vera of sweet cherry and papaya ,mango and date palm (Martinez- Romero *et al*., 2006; Marpudi *et al*., 2011and Sophia *et al*.,2015 and Sahar *et al*., 2019) as they concluded that these coating reduced respiration ,prolong post-harvest fruit life and maintained quality**.**

Table 15: Effect of some safe coating treatments on Total sugar % of Star light Grapes fruits stored at 0±1˚C during 2020 and 2021 seasons.

Treatment	2020 Season									
	Storage Period (weeks)									
	Initial	1 st	2 nd	3 rd	4 th	5 th	6 th	7 th	8 th	Mean
EEP 4%+ Aloe Vera gel 33%	15.1	15.74	15.84	15.94	16.61	17.71	19.67	19.43	21.51	17.51
EEP 4%+GSE 1%	14.77	15.87	16.31	16.75	17.85	17.92	18.52	20.16	23.39	17.95
EEP 4%+ Alginate 2%	15.25	16.92	16.95	16.98	18.17	18.94	19.01	19.75	22.49	18.27
EEP 4%	15.47	16.64	16.86	17.07	17.97	18.51	19.38	20.99	23.14	18.45
Aloe Vera gel 33%+GSE 1%	14.49	15.96	16.57	17.18	17.63	19.36	19.74	21.46	25.24	18.63
Aloe Vera gel 33%+ Alginate 2%	15.77	17.27	16.9	16.52	18.1	18.47	19.46	20.73	24.99	18.69
Aloe Vera gel 33%	15.56	15.62	16.13	16.63	17.88	19.53	20.53	21.15	25.16	18.69
Alginate 2% + GSE 1%	14.49	16.67	17.35	18.03	19.47	19.43	19.59	20.84	23.69	18.84
GSE 1%	14.91	16.52	17.18	17.83	19.54	19.91	20.97	22.4	25.87	19.46
Alginate 2%	15.32	16.37	17	17.63	19.61	20.38	22.35	23.96	28.04	20.07
control	16.32	16.83	17.57	18.31	20.61	22.4	24.15	27.95	30.04	21.58
Mean	15.22	16.40	16.79	17.17	18.49	19.32	20.31	21.71	24.87	
LSD value at 0.05		Treatments(T): 0.68			Storage period (p): 0.61				Interaction (T×P): 3.47	

Treatment	2021 Season									
	Storage Period (weeks)									
	Initial	1 st	2 nd	3 rd	4 th	5 th	6 th	7 th	8 th	Mean
EEP 4%+ Aloe Vera gel 33%	14.66	15.3	15.4	15.5	16.17	17.27	19.23	18.99	21.07	17.07
EEP 4%+GSE 1%	14.33	15.43	15.87	16.31	17.41	17.48	18.08	19.72	22.95	17.51
EEP 4%+ Alginate 2%	14.81	16.48	16.51	16.54	17.73	18.5	18.57	19.31	22.05	17.83
EEP 4%	15.03	16.2	16.42	16.63	17.53	18.07	18.94	20.55	22.7	18.01
Aloe Vera gel 33%+GSE 1%	14.05	15.52	16.13	16.74	17.19	18.92	19.3	21.02	24.3	18.13
Aloe Vera gel 33%+ Alginate 2%	15.33	16.83	16.46	16.08	17.66	18.03	19.02	20.29	24.55	18.25
Aloe Vera gel 33%	15.12	15.18	15.69	16.19	17.44	19.09	20.09	20.71	24.72	18.25
Alginate 2% + GSE 1%	14.93	17.11	17.79	18.47	19.91	19.87	20.03	21.28	24.13	19.28
GSE 1%	14.91	16.52	17.18	17.83	19.54	19.91	20.97	22.4	25.87	19.46
Alginate 2%	14.88	15.93	16.56	17.19	19.17	19.94	21.91	23.52	27.6	19.63
control	15.88	16.39	17.13	17.87	19.17	20.96	23.71	26.51	29.9	20.84
Mean	14.90	16.08	16.47	16.85	18.08	18.91	19.99	21.30	24.53	
LSD value at 0.05		Treatments(T): 1.03			Storage period (p): 0.93				Interaction (T×P):5.25	

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Table 16: Effect of some safe coating treatments on Total sugar % of Star light Grapes fruits stored at 10±1˚C during 2020 and 2021 seasons.

Treatment	Season 2020					
	Storage Period (days)					
	Initial	3	6	9	12	Mean
EEP 4%+ Aloe Vera gel 33%	21.51	23.01	24.58	26.35	28.41	24.77
EEP 4%+GSE 1%	22.49	23.14	25.01	26.88	28.48	25.20
EEP 4%+ Alginate 2%	23.39	24.01	26.31	27.64	28.21	25.91
EEP 4%	23.69	25.17	27.48	28.79	30.21	27.07
Aloe Vera gel 33%+GSE 1%	23.14	25.01	27.25	29.41	31.47	27.26
Aloe Vera gel 33%+ Alginate 2%	24.74	26.81	28.04	29.12	31.41	28.02
Aloe Vera gel 33%	24.99	26.27	28.06	29.54	31.42	28.06
Alginate 2% + GSE 1%	25.16	27.54	29.84	31.27	32.51	29.26
GSE 1%	25.87	28.03	30.14	32.81	34.77	30.32
Alginate 2%	28.04	30.2	32.45	34.59	36.47	32.35
control	28.04	30.21	32.18	34.48	37.14	32.41
Mean	24.64	26.31	28.30	30.08	31.86	
LSD value at 0.05	Treatments(T):0.74		Storage period (p):0.49		Interaction (T×P): 2.77	

Treatment	Season 2021					
	Storage Period (days)					
	Initial	3	6	9	12	Mean
EEP 4%+ Aloe Vera gel 33%	21.07	22.41	23.73	25.15	27.51	23.97
EEP 4%+GSE 1%	22.05	23.14	24.71	25.78	27.19	24.57
EEP 4%+ Alginate 2%	22.7	23.51	25.15	27.01	29.17	25.51
EEP 4%	22.95	23.71	25.41	27.14	29.01	25.64
Aloe Vera gel 33%+GSE 1%	24.55	25.37	27.06	28.84	31.32	27.43
Aloe Vera gel 33%+ Alginate 2%	24.3	25.02	27.44	29.22	31.41	27.48
Aloe Vera gel 33%	24.72	26.14	28.54	30.07	32.11	28.32
Alginate 2% + GSE 1%	24.13	26.77	29.18	31.19	33.41	28.94
GSE 1%	25.87	27.13	29.24	31.18	33.37	29.36
Alginate 2%	27.6	28.4	29.65	31.58	33.07	30.06
control	27.6	28.41	31.68	34.78	36.14	31.72
Mean	24.32	25.46	27.44	29.27	31.25	
LSD value at 0.05	Treatments(T): 0.75		Storage period (p):0.49		Interaction (T×P):2.81	

ISSN 2063-5346 *Section A-Research paper*

Conclusion

Using all safe coating application (Propolis & Aloe Vera gel & Grapefruit Seed extract Alginate) alone or in combination between them by spray clusters on grapevines at one day before harvest had a more pronounced positive effect on berry quality of "Star light" grapes at 0°C and 90-95 % RH for 8 weeks cold storage and 12 days marketing life at 10°C as control postharvest decay and maintain on compositional changes by delaying physical and chemical changes, slowing down respiration rate during cold storage and extending postharvest life. Therefore, it is possible to conduct preparation of grape clusters to get a product safe and healthy, non-chemical, non-toxic and increase the maintenance of the quality clusters and preserves marketability without causing any damage during handling, long transportation, shipping and export thus extend post-harvest life of star light grape clusters. Therefore, it is possible to extend exportation season 68 days of star light grape from harvest time at 10 June until 8 weeks cold storage and followed by 12 days marketing life so, we can export abroad during July, August months to supply the external markets with grapes especially in this period as no availability of this type of star light grape in the international markets and thus maximize the economic value of grapes.

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