Influence of Bud Load Levels and Fruit Unit Length on Growth, Productivity, Fruit Quality and Clusters Storability under Cold Storage of Midnight Beauty Grapevine

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ABSTRACT

This study was conducted over two seasons (2022 and 2023) at a private vineyard in EL-Sadat city, Monofia Governorate. The chosen vines were 7 years old, planted in sandy soil, spaced at 2 x 3 meters apart, drip-irrigated, and trellised with a gable support. Vines were trained to quadrilateral cordon and spur pruned and clipped in the last week of December in both study seasons. Three different levels of pruning were used, namely (48, 72 and 96 nodes vine) under three different lengths of the nodes (2,4 and 6 nodes) with different number of fruiting spurs of Midnight Beauty Grapevine. Results show the number of clusters and yield per vine increased gradually as pruning per vine increased from 48 nodes per vine to 72 nodes per vine or 96 nodes per vine, while the physiochemical properties of clusters and berries gradually decreased. So, it can be recommended that pruning Midnight Beauty grapevine at 48 nodes/vine (24 spurs×2 nodes) gave the maximum values of bud behaviour, vegetative growth parameters, and berry physical and dormant season parameters, while vines pruned at 96 (48 spurs × 2 nodes) gave the highest yield per vine. All treatments have good quality under cold storage condition. The lowest significant percentage of fruit weight loss and decayed berries which recorded for 72 buds per vine with (18 spurs × 4 nodes). While clusters from vines pruned at 96 (48 spurs × 2 nodes) reduced shatter percentage and total titratable acidity with increasing in TSS.

Keywords: Midnight beauty grapevine- Bud load- Pruning- Productivity- Cold storage

INTRODUCTION

Grapes (*Vitis vinifera* L.) are one of the world's most widely grown fruit crops, with significant economic value in the production of fresh fruit, wine, juice, and raisins. With a harvested area of 7.2 million hectares producing 70.8 million tons annually at an average of 11.23 tons/hectare, grape is the third most popular fruit crop globally (OIV, 2023) and ranks fourth in Egypt in terms of production area and consumption rates, behind citrus, mango, and olive fruit crops. Over the past ten years, Egypt's grape acreage has increased significantly, reaching 91,633 hectares harvested and yielding 1.517,976 tons (FAO, 2022). In May 1990, David W. Cain in Wasco, Kern County, California, crossed Fantasy Seedless with unknown seedling 17-138 to make Midnight Beauty, a hybrid. It was initially propagated asexually in December 1992, and the US plant patent was issued in June 1998. Midnight Beauty is a registered variety of Sun World International LLP in California.

Midnight Beauty is a seedless black grape with medium-large, elongated fruit. This variety of grape entered Egypt with many other varieties that were recently introduced, and their main purpose is export.

Bud load, or the number of buds left on the vine after pruning, is an important factor that influences grapevine productivity and fruit quality (Keller, 2010). Pruning is one of the most significant horticultural procedures in viticulture since it affects fruit production and quality.

Pruning is used to control the form, size, and vigour of the vine, which in turn affects crop quantity and quality. Pruning is frequently done in the dormant season after analysing winter damage. The pruning procedure is mostly dependent on the fertility of the cultivar's basal buds, which were found during the previous growth season. Previous research has helped predict pruning recommendations, fruitfulness, and prospective yield (Palanichamy et al.,

2011). Similarly, the Grillo cultivar's basal buds are less fertile; therefore, cane length influences the quantity and weight of bunches depending on bud fertility (Lorenzo and Pisciotta, 2019). Balanced grapevine pruning enhances crop load management (Bates et al., 2021). As a result, bud behaviour, vine vigour, production, and quality are all important factors to consider when managing pruning severity.

Bud load control is crucial in grapevine production because it directly affects the balance of vegetative and reproductive growth (Reynolds et al., 1996).

This experiment investigated the influence of bud load on Midnight Beauty grape yield and fruit quality. However, research on related cultivars can yield important information. Tregoat et al. (2002) observed that increasing bud load resulted in increased production, but lower fruit quality as measured by sugar content, acidity, and phenolic compounds in Merlot grapevines. (Kliewer and Dokoozlian, 2005), on the other hand, discovered that reducing bud load led to improved fruit quality in Thompson Seedless grapes, including higher sugar content and lower acidity. Bud load influences grapevine productivity because growing buds fight for resources including water, nutrients, and carbohydrates (Keller, 2010).

Egyptian grapes are transport to many countries, this may be gathering from two to three weeks to reveal to the Importing country according to the type of shipment and distance, sometimes there are countries that require cooling to a certain degree before exporting.

Studies demonstrated that storage in low-temperature protect fruits by organizing antioxidant activity, so lowering the gathering of reactive oxygen species (ROS). This technique support to lowering nutrient consuming and safe fruit quality. (Ayala, et al., 2024) Table grapes are very perishable fruit that due to losses in water resulting of rachis and pedicel drying due to browning, berry softening, loss in weight and decay by fungi done which caused mostly by Botrytis cinerea caused large losses (Romanazzi, et al., 2012).

The impact of bud load on Midnight Beauty grape yield and fruit quality is a complex and subtle issue that demands more investigation. As a result, the primary purpose of this research is to increase production and fruit quality by determining the optimal bud load and its effect on bud behaviour.

MATERIALS AND METHODS

Midnight Beauty Grapevine (*Vitis vinifera L.*) that were 7 years old and cultivated on sandy soil in a private vineyard in El-Sadat city, Monofia Governorate, Egypt, were utilized in this study in two consecutive seasons (2022 and 2023). The chosen vines spaced 2 x 3 meters apart, fed by drip fertigation system, trellised with a gable supporting system and clipped in the last week of December for both studied seasons. The experiment used 81 vines (3 replicates with 3 vines per treatment × 9 treatments) that grew identically to the crops and followed identical farming procedures. A randomized full-block design was used to analyse the outcomes. Vines were taught quadrilateral cordon and spur pruning. Three levels of pruning were used: 48, 72, and 96 node pre vines, including spur lengths (2, 4, and 6 nodes).

The study included nine treatments:

T1: 48 nodes (24 spurs×2 nodes)
T2: 48 nodes (12 spurs× 4 nodes)
T3: 48 nodes (8 spurs × 6 nodes)
T4: 72 nodes (36 spurs×2 nodes)
T5: 72 nodes (18 spurs × 4 nodes)
T6: 72 nodes (12 spurs × 6 nodes)
T7: 96 nodes (48 spurs × 2 nodes)
T8: 96 nodes (24 spurs × 4 nodes)
T8: 96 nodes (16 spurs × 6 nodes)

Measurement:-

Bud behaviour parameters: The numbers of total buds were recorded during pruning time (last week of December), while the number of dormant buds and number of bursted buds were recorded after bud break (the 2nd week of March), as follows:

Bud burst (%): The percentage of bud burst was computed by dividing the number of burst buds by the total number of buds remaining per vine and multiplied by 100.

Dormant bud (%): dormant bud percentage is calculated by dividing the number of dormant buds per vine by the total number of buds per vine (×100).

Bud fertility (%): The number of clusters per vine divided by the total number of buds per vine × 100).

The number of fruitful buds: the number of fruitful buds per vine (buds which gave at least one cluster).

Vegetative growth:

Leaf area (cm^2): According to Liu et al. (2015)

Total chlorophyll (SPAD)*:* Total chlorophyll measurement (SPAD unit) using a chlorophyll meter (SPAD-502, Soil-Plant Analysis Department (SPAD) department, Minolta Camera Co., Osaka, Japan).

Yield and fruit characteristics:

Physical parameters of the cluster: At harvest, six clusters per replicated (18 clusters /treatment) were randomly harvested when the average total soluble solids content percentage in berry juice attained about 16 % in untreated vines. Yield (kg/vines) six clusters from each replicate were weighted and the average of cluster weight was multiplied by number of clusters/vines to calculate the average yield as kg/vine. and it was obtained to quantify cluster width (cm) and cluster length.

Berry physical parameters: During harvest, 100 berries were randomly picked from the basal, middle, and apical areas of the representative clusters to determine their physical and biochemical characteristics. Berry length (cm), berry width (cm),berry weight (g), berry volume (cm^3) and are the three physical qualities involved.

Berry biochemical characteristics:

Total soluble solids percentage using the refractometer equipment described in A.O.A.C. (2000).

Total acidity: The acidity of 10 mL of berry juice was determined the titration procedure was used. The berry extract was mixed with 100 millilitres of distilled water. The overall acidity percentage was determined using titration with 0.1 N NaOH. Tartaric acid (%), equivalent to g/100 mL of juice (A.O.A.C., 2000), was used to indicate total acidity.

TSS/acid ratio.

Dormant parameters:

A-Weight of pruning was carried out at the time of winter pruning (g)

B- Wood ripening :According to Bouard (1966) calculated the amount of wood ripening by dividing the length of the ripened section of the shoot by the overall length of the shoot.

C-Total carbohydrates in cane content (%): according to the method described by Herbert et al. (1971).

Storage parameters:

Three Clusters for every treatment were stored at 5°C and 85% humidity in small cartoon boxes (30 x 23 x 10) every box has (1.5 – 2 kg) in average. Samples for each treatment were taken every 5 days for 20 days to determine changes in fruit quality under storage. The followed parameters were taken.

Weight loss percentage was deliberate according to the following equation: [cluster weight (g) after storage/cluster weight (g) before storage] X 100

Decay percentage was identified by divided [weight of the decayed berries/the initial cluster weight (g)] X 100.

Shatter percentage was calculated by divided [weight of the shattered berries / the initial cluster weight (g)] X 100

Bunch freshness:

Stem color, dryness and berry appearance were estimated as shown in the **Table (1)** according to Mohamed and Hassan (2003)

Table (1). Bunch freshness.

Degree Properties	1	2	3	4
Stem color	Green	Little green	Little brown	Brown
Stem dryness	Plump	50% dry	Dry	Very dry
Berry appearance	Excellent	Good	Acceptable	Poor

Statistical analysis: The results were statistically analysed using F-value test, and the means were compared by the L.S.D at the level of 5% probability f according to Snedecor and Cochran's (1980) randomized complete block design, with treatment combinations distributed randomly to experimental units within a block.

RESULTS AND DISCUSSION

1-Bud behaviour:

Table (2) shows the parameters related to bud behaviour, including percentages of dormant buds, burst buds, bud fertility, and number of fruitful buds. These parameters were analysed under various levels of bud load. In general, vines pruned with 48 buds had a reduced percentage of dormant buds compared to vines pruned with 72 and 96 buds. Vines pruned with 96 nodes (16 spurs x 6 nodes) produced the most significant percentages of dormant buds in the two seasons, but Vines pruned with 48 nodes (24 spurs x 2 nodes) a produced the fewest percentages of dormant buds in both study seasons.

Otherwise, the data clearly showed that there were substantial variations in percentage of bud burst and fertility between all evaluated bud load treatments over both seasons. In both seasons, the vines pruned with 48 nodes produced the highest significant percentage of bud burst and fertility, followed by 72 nodes followed by 96 nodes. Vines pruned with 48 nodes (24 spurs x2 nodes) produced the highest significant percentage of bud burst and fertility. Vines pruned with 96 nodes (16 spurs x 6 nodes) gave the lowest significant percentage of bud burst and fertility in the two seasons. Regarding the number of fruitful buds, the results depicted in Table 2 demonstrate that the number of fruitful buds increases with the increase in the bud load on the grapevine. Vines pruned with 96 nodes produced the highest significant percentage of fruitful buds, followed by 72 nodes followed by 48 nodes. Pruning treatment of 96 nodes per vine (48 spurs × 2 nodes) exhibited higher values for the number of fruitful buds in contrast Vines pruned with 48 nodes (8 spurs × 6 nodes) produced the fewest number of fruitful buds in both study seasons.

The findings are consistent with (Ahmad et al., 2004) who discovered that extreme pruning increased bud burst percentage, which was proportionate to the number of nodes. (Sabry et al., 2020) also discovered that the quantity of buds per cane influenced bud burst and fertility. They discovered a considerable increase in bud burst and bud fertility in Red Globe grapevines, which was associated with a decrease in cane length. Furthermore, (Samra et al., 2006) found that increasing the number of buds per cane of Superior seedless lowered the burst percentage. The rise in burst percentage might be related to nutrients in burst-out vines. (Abo-ELwafa, 2018) who reported that early sweet vines which were pruned at 24 spurs×2 nodes (48 nodes / vine) gave the highest significant value of bud burst and bud fertility percentages as compared with 48 spurs×2 nodes (96 nodes / vine) during both seasons.

Table (2). Effect of bud load Levels and fruit unit length on bud behaviour characteristics of Midnight Beauty grapevine during 2022 and 2023 seasons.

Treatments		Dormant bud		Bud burst (%)		Fertility (%)		No. of fruitful buds	
		2022	2023	2022	2023	2022	2023	2022	2023
48 nodes	24 spurs×2 nodes	8.33	13.19	91.67	86.81	64.73	64.43	25.67	29.67
	12 spurs× 4 nodes	12.04	17.59	87.96	82.41	53.16 d	60.62	22.67	25.67
	8 spurs × 6 nodes	13.54	12.50	86.46	87.50	55.94	53.21	22.67	20.33
72 nodes	36 spurs×2 nodes	13.43	20.37	86.57	79.63	66.46 a	71.76	43.67	39.00
	18 spurs × 4 nodes	15.97	5.56 c	84.03	94.44	53.94	44.96	33.67	36.00
	12 spurs × 6 nodes	21.53	18.06	78.47	81.94	60.77a-	65.30	29.33	26.67
96 nodes	48 spurs × 2 nodes	25.35	17.59	74.65	74.65	60.52	54.59	46.33	44.67
	24 spurs × 4 nodes	32.29	20.49	67.71	79.51	61.65	57.03	40.00	44.00
	16 spurs × 6 nodes	32.87	25.35	67.13	82.41	57.04	49.37	46.33	44.67

Data in each column are not significant at 5 % have the same letters.

2-Vegetative growth:

The results depicted in **Table (3)** show the examined bud load treatments in both seasons clearly demonstrate that the treatment with the fewest number of buds per vine the highest vegetative growth parameters, including chlorophyll content as SPAD and leaf area of Midnight Beauty grapevine during 2022 and 2023 seasons

In both seasons, the vines pruned with 48 nodes produced the highest significant chlorophyll content as SPAD and leaf area, followed by 72 nodes followed by 96 nodes. Vines pruned with 48 nodes (24 spurs x2 nodes) produced the highest significant chlorophyll content as SPAD and leaf area. Vines pruned with 96 nodes (24 spurs × 4 nodes) gave the lowest significant chlorophyll content as SPAD and leaf area in the two seasons. In terms of vegetative growth, vines that have been pruned to two nodes per spur are superior to those that have been pruned to four or six nodes per spur. The positive effect of light or moderate buds' load/ vine on enhancing vegetative growth parameters may be due to reducing the competition among the shoots, promote bursting of laterals buds, growth and leaf elongation, (Bassiony, 2020).

These findings were stated by (Ali et al., 2016) found that the favourable effect of judicious pruning on leaf area, elements, and chlorophyll content leads to higher productivity and fruit quality in Superior grapevines. Similar results were noticed by (Porika et al., 2017) on the Red Globe grapevine cultivar. They reported that the accumulation of leaf chlorophyll content in response to different levels of pruning severity. The canes pruned to 50% for vegetative growth (2 buds level), and the remaining 50% for crop yield (6 buds level) recorded the maximum total chlorophyll content. They also decided that chlorophyll content was a crucial factor in determining the rate of photosynthesis, which was considered an index of the metabolic efficiency of the vine.

Table (3). Effect of bud load levels and fruit unit length on leaf area and total chlorophyll content of Midnight Beauty grapevine during 2022 and 2023 seasons.

Treatments		Total chlorophyll content (SPAD)		Leaf area (cm^2)	
		2022	2023	2022	2023
48 nodes	24 spurs×2 nodes	53.47 a	54.43 a	151.61 a	156.06 a
	12 spurs× 4 nodes	51.37 b	50.13 bc	149.50 ab	154.41 a
	8 spurs × 6 nodes	49.03 c	50.97 ab	139.72 c	152.82 ab
72 nodes	36 spurs×2 nodes	47.87 cd	48.23 bcd	142.46 bc	147.90 bc
	18 spurs × 4 nodes	47.63 cd	48.27 bcd	144.61 abc	145.33 c
	12 spurs × 6 nodes	46.90 cd	46.23 d	141.80 c	139.09 d
96 nodes	48 spurs × 2 nodes	47.17 cd	46.63 d	129.41 d	135.54 de
	24 spurs × 4 nodes	46.57 d	46.27 d	123.83 d	129.98 e
	16 spurs × 6 nodes	46.10 d	45.05 d	128.35 d	130.76 e

Data in each column are not significant at 5 % have the same letters.

3- Physical characteristics of clusters and yield:

The data presented in **Table (4)** show the physical parameters such as cluster length, width, and weight of Midnight Beauty Grapevine under different bud load level during the 2022 and 2023 seasons. In both seasons, the vines pruned with 48 nodes produced the highest significant cluster length, width, and weight, followed by 72 nodes followed by 96 nodes. Vines pruned with 48 nodes (24 spurs x 2 nodes) produced the highest significant cluster length, width, and weight. Vines pruned with 96 nodes (16 spurs × 6 nodes) gave the lowest significant cluster length, width, and weight in the two seasons. In terms of cluster length, width, and weight, vines that have been pruned to two nodes per spur are

superior to those that have been pruned to four or six nodes per spur.

Regarding the yield per vine, the results depicted in **Table (4)** demonstrate that the yield per vine increases with the increase in the bud load on the grapevine. Vines pruned with 96 nodes produced the highest significant percentage of yield per vine, followed by 72 nodes followed by 48 nodes. Pruning treatment of 96 nodes per vine (48 spurs × 2 nodes) exhibited higher values for the yield per vine. In contrast vines pruned with 48 nodes (8 spurs × 6 nodes) produced the fewest yield per vine in both study seasons.

Severe pruning (low buds load level) may improve physical characteristics by reducing the number of clusters per vine, which lessens competition between clusters. Our findings concur with those of (Fawzi et al., 2010), who discovered that while bunch weight decreased with increasing bud load, the frequency of Crimson seedless bunches and vines increased considerably. (Grobrial 2018) discovered that while cluster weight decreased, cluster number and total yield/vine increased as bud load/vine increased. Additionally, (Abo-Elwafa, 2018) found that the vines that were pruned at 48 nodes/vine had the highest cluster weight values in both seasons, compared to 72 and 96 nodes/vine, while the vines that were pruned at 96 nodes/vine produced the highest yield per vine

Table (4). Effect of bud load levels and fruit unit length on physical characteristics of cluster and yield of Midnight Beauty grapevine during 2022 and 2023 seasons.

Treatments		Cluster length (cm)		Cluster width (cm)		Cluster weight (g)		Yield	
		2022	2023	2022	2023	2022	2023	2022	2023
48 nodes	24 spurs×2 nodes	26.00 a	24.00 a	20.67 ab	18.67 a	577a	580.67a	16.92d	15.48c
	12 spurs× 4 nodes	26.00 a	23.00 ab	19.67 abc	18.33 a	573.67ab	578.67a	13.005e	14.85c
	8 spurs × 6 nodes	25.67 a	22.67 ab	16.67 c	16.67 a	547.67ab	561.67a	12.415e	11.41e
72 nodes	36 spurs×2 nodes	24.67 a	22.67 ab	17.00 bc	17.00 a	497.33ab	554.33a	21.718b	21.61b
	18 spurs × 4 nodes	24.33 ab	21.67 ab	19.67 abc	17.33 a	475.33abc	532a	16.06c	19.15bc
	12 spurs × 6 nodes	24.00 ab	21.67 ab	19.33 abc	18.67 a	468.33ab	502.67a	12.03e	14.914c
96 nodes	48 spurs × 2 nodes	23.33 ab	21.33 ab	21.33 a	17.00 a	483.6c	532a	22.409a	23.764 a
	24 spurs × 4 nodes	21.67 b	21.00 ab	20.33 abc	17.67 a	439.33c	478.33a	17.5bc	21.04b
	16 spurs × 6 nodes	21.67 b	19.67 b	17.67 abc	17.00 a	430.33c	428.33a	19.93bc	19.13bc

Data in each column are not significant at 5 % have the same letters.

4-Physical characteristics of berries:

Table (5) shows how the number of buds with varied numbers of spurs and bud load level affects several physical qualities of berries (berry length, berry width, berry weight and berry volume) of Midnight Beauty grapevine during 2022 and 2023 seasons. In both seasons, the vines pruned with 48 nodes produced the highest significant physical qualities of berries, followed by 72 nodes followed by 96 nodes. Vines pruned with 48 nodes (24 spurs x 2 nodes) produced the highest significant physical qualities of berries. Vines pruned with 96 nodes (16 spurs × 6 nodes) gave the lowest significant physical qualities of berries in the two seasons.

Bassiony (2020) discovered that severe and moderate pruning levels resulted in the highest weight values per berry. Meanwhile, the low bud load level had the maximum volume of berries when compared to the other pruning levels. The good effect of heavy pruning on berry characteristics might be attributed to the reduction in the number of clusters per vine, which minimizes rivalry between clusters.

The revealed fruiting parameters and characteristics are like those of (Mohamed et al., 2023), who discovered that pruning at 12

fruiting canes and 10 eyes per cane resulted in a greater berry weight and berry size of the Black Magic grape cultivar.

Table (5). Effect of bud load levels and fruit unit length on Physical characteristics of berries of Midnight Beauty grapevine during 2022 and 2023 seasons.

Treatments		Berry length (cm)		Berry width (cm)		Berry weight (g)		Berry volume (cm^3)	
		2022	2023	2022	2023	2022	2023	2022	2023
48 nodes	24 spurs×2	3.07	3.13 a	2.20 a	2.27 a	5.40 a	6.43 a	4.97 a	5.23 a
	12 spurs× 4	3.03	3.03 ab	2.17 ab	2.17 b	4.83 b	5.40 b	4.50 b	4.83 b
	8 spurs × 6	3.00	3.03 ab	2.13 a-c	2.12 bc	4.80 bc	5.03 c	4.27 bc	4.53 c
72 nodes	36 spurs×2	2.97	3.03 ab	2.10 a-c	2.10 cd	4.67 bc	5.73 d	4.13 cd	4.50 c
	18 spurs × 4	2.90	2.98 bc	2.07 b-d	2.05 de	4.60 c	5.70 d	4.07 cd	4.50 c
	12 spurs × 6	2.87	2.98 bc	2.03 cd	2.05 de	4.60 c	5.57 d	4.93 d	4.43 c
96 nodes	48 spurs × 2	2.80	2.98 bc	2.03 cd	2.05 de	4.37 d	4.57 d	3.53 e	3.33 c
	24 spurs × 4	2.80	2.93 bc	2.03 cd	2.03 e	3.40 e	4.33 e	3.10 f	3.57 d
	16 spurs × 6	2.60 e	2.88 c	1.97 d	2.03 e	3.33 e	4.90 f	3.07 f	3.57 d

Data in each column are not significant at 5 % have the same letters.

5- Chemical characteristics berries:

Table (6) showed the influence of a number of buds with varying numbers of spurs and bud load level on the chemical characteristics of Midnight Beauty grapevines, as measured by TSS%, acidity %, and TSS acid ratio, during both seasons. Vine pruned at 96 nodes (48 spurs × 2 nodes) had the greatest TSS% in the first season but were not significant in the second season. Vines pruned at 48 nodes (8 spurs×6 nodes) gave the lowest TSS% in the first season but were not significant in the second season

Regarding the acidity %, Vines pruned at 72 nodes (36 spurs × 2 nodes) and 96 nodes (48 spurs × 2 nodes) gave the lowest acidity in both seasons, respectively. It should be remembered that the acidity percentage is opposite the TSS percentage. Furthermore, the data showed that the TSS acid ratio followed the same pattern as the TSS percentage. In the first season, vines pruned at 96 nodes (2 nodes × 48 spurs) and t 48 nodes (6 nodes × 8 spurs) had the highest values. However, in the second season, some treatments were less significant, but the highest values recorded by 48 nodes (8 spurs × 6 nodes) and 96 nodes (16 spurs×6 nodes).

These findings are consistent with those of (Gaser et al., 2017), who discovered that long-pruning vines had a much lower juice TSS%, TSS/acid ratio content, and a higher overall acidity content than short-pruning vines. Furthermore, (Ghobrial, 2018) discovered that vines pruned severely with a cane length of 6 buds had the highest significant values of TSS and TSS/acid ratio content of the berry and the lowest value of acidity, with no significant differences between them. While the cane length of 15 buds had considerably the lowest values of these, except for acidity, which showed. (Porika et al., 2015) found that strongly trimmed vines generated higher TSS, a higher a higher TSS/acid ratio, and lower acidity than less severely pruned vines. The increase in total soluble solids and TSS/acid ratio might be attributed to decreased competition for metabolites among the limited number of bunches, as well as the availability of more photosynthetic resources, resulting in increased vigour and improved physiologic.

Table (6). Effect of bud load levels and fruit unit length on some chemical characteristics of berries of Midnight Beauty grapevine during 2022 and 2023 seasons.

Treatments		TSS (%)		Acidity (%)		TSS/acid ratio	
		2022	2023	2022	2023	2022	2023
48 nodes	24 spurs×2 nodes	17 ab	17 a	0.80 b	0.73 ab	21.25 bc	23.28 ab
	12 spurs× 4 nodes	17 ab	16.67 a	0.80 b	0.68 b	21.25 bc	24.511 a
	8 spurs × 6 nodes	16.67 b	17 a	0.80 b	0.68 b	20.83 bc	25 a
72 nodes	36 spurs×2 nodes	17 ab	16.67 a	0.77 bc	0.72 ab	22.07 b	23.15 ab
	18 spurs × 4 nodes	17.67 ab	16.83 a	0.80 b	0.68 b	22.08 b	24.75 a
	12 spurs × 6 nodes	17 ab	16.5 a	0.77 bc	0.75 a	22.07 b	22 b
96 nodes	48 spurs × 2 nodes	18 a	16.83 a	0.73 c	0.72 ab	24.65 a	23.37 ab
	24 spurs × 4 nodes	17.33 ab	16.67 a	0.87 a	0.75 a	19.91 c	22.22 a
	16 spurs × 6 nodes	17.33 ab	17 a	0.80 b	0.68 b	21.66 bc	25 a

Data in each column are not significant at 5 % have the same letters.

6- Weight of pruning, wood ripening, and carbohydrates in canes:

The results depicted in **Table (7)** show the examined bud load treatments in both seasons clearly demonstrate that the treatment with the fewest number of buds per vine had the highest dormant season parameters in canes parameters, including pruning wood weight and ripening wood and total carbohydrates in canes of Midnight Beauty grapevine during the 2022 and 2023 seasons. In both seasons. Vines pruned with 48 nodes (24 spurs x2 nodes) and 72 nodes (24 spurs x2 nodes) produced the highest significant pruning wood weight and ripening wood content of carbohydrates in the canes

On the other hand, the treatment of pruning at 72 buds per vine with (18 spurs × 4 nodes) gave the lowest values compared with other study treatments. Our findings are consistent with those of (Omar and Abdel-Kawi, 2000), which indicate that an increase in foliage leads to a denser canopy, promoting enhanced active photosynthesis and greater carbohydrate storage in new canes. Similarly, (El-Baz et al., 2002) observed comparable results with Crimson seedless grapevines. Furthermore, (Genaidy, 2015) noted that increasing the number of buds in the vineyard resulted in less weight loss from both wood pruning and mature wood.

Table (7). Effect of bud load levels and fruit unit length on carbohydrates, wood ripening and weight of pruning/vine of Midnight Beauty grapevine during 2022 and 2023 seasons.

Treatments		Weight of pruning/vine(g)		Wood ripening		carbohydrates (%)	
		2022	2023	2022	2023	2022	2023
48 nodes	24 spurs×2	3.90 a	4.37 a	0.972 a	0.981 a	36.653 a	36.70 a
	12 spurs× 4	3.00 bcd	3.30 bc	0.913 d	0.931 c	32.257 f	36.17 b
	8 spurs × 6	2.90 cd	3.20 c	0.823 e	0.840 d	33.080 e	35.82 c
72 nodes	36 spurs×2	4.10 a	4.30 a	0.967 b	0.970 a	36.147 b	32.26 g
	18 spurs × 4	3.10 bc	3.40 bc	0.912 d	0.927 c	33.843 d	31.96 h
	12 spurs × 6	2.80 d	2.90 d	0.765 g	0.770 e	33.143 e	33.12 f
96 nodes	48 spurs × 2	3.90 a	4.20 a	0.957 c	0.950 b	36.163 b	36.06 b
	24 spurs × 4	3.20 b	3.50 b	0.913 d	0.921 c	35.757 c	33.84 e
	16 spurs × 6	2.90 cd	3.20 c	0.782 f	0.780 e	33.860 d	34.96 d

Data in each column are not significant at 5 % have the same letters.

8- Weight loss percentage:

Regarding the effect of storage periods, the findings indicated that in **Table (8)** the weight loss% of Midnight Beauty grapevine increased gradually and significantly as the cold storage (5 ° C and 85% RH) was extended in the 2022 and 2023 seasons. The lowest significant percentage of fruit weight loss which recorded for 72 nodes per vine with (18 spurs × 4 nodes) vine. In general, 72 nodes per vine gave the lowest values compared with other study treatments. The highest loss in weight recorded for 96 nodes per vine. That is true in the two seasons of study. Weight loss (%) increased with increasing storage period due to berries continue respiration intake and transpiration water loss (Ozturk, et al., 2021), Prevalence of water vapor compressing caused by respiration due to loss in moisture from fresh fruits (Jawandha, et al., 2012).

Table (8). Effect of cold storage on loss in weight percentage of Midnight Beauty grapes from vines pruned at different levels of nodes during 2022 and 2023 seasons.

Weight loss (%)							
Treatments		0 days	5 days	10 days	15 days	20 days	Means
Season 2022							
48 nodes	24 spurs×2 nodes	0.0 h	0.91 g	1.94 f	3.75 d	5.86 b	2.43 A
	12 spurs× 4 nodes	0.0 h	0.71 g	1.68 f	3.41 d	5.38 b	2.23 A
	8 spurs × 6 nodes	0.0 h	0.75 g	1.68 f	3.65 d	6.08 a	2.43 A
72 nodes	36 spurs×2 nodes	0.0 h	0.83 g	1.80 f	3.70 d	5.63 b	2.39 A
	18 spurs × 4 nodes	0.0 h	0.45h	1.33 f	2.89 e	4.87 d	1.90 B
	12 spurs × 6 nodes	0.0 h	0.89 g	1.76 f	3.11 d	5.14 b	2.18 A
96 nodes	48 spurs × 2 nodes	0.0 h	1.12 f	2.14e	4.11 c	6.75 a	2.82 A
	24 spurs × 4 nodes	0.0 h	1.08 fg	2.10 e	3.93 d	6.49 a	2.72 A
	16 spurs × 6 nodes	0.0 h	1.06 fg	2.16 e	4.07 c	6.19 a	2.69 A
Means		0.0 E	0.86 D	1.84 C	3.62 B	5.82 A	
Season 2023							
48 nodes	24 spurs×2 nodes	0.0 h	0.81g	1.81 ef	3.67 d	5.48 b	2.35 A
	12 spurs× 4 nodes	0.0 h	0.75 g	1.98 ef	3.72 d	5.73 b	2.43 A
	8 spurs × 6 nodes	0.0 h	0.81 g	1.84 ef	3.87 d	5.81 b	2.46 A
72 nodes	36 spurs×2 nodes	0.0 h	0.75 g	1.73 ef	3.40 d	5.13 b	2.20 A
	18 spurs × 4 nodes	0.0 h	0.63 g	1.55 e	3.54 d	5.10 b	2.16 A
	12 spurs × 6 nodes	0.0 h	0.84 g	1.67 ef	3.37 d	5.07 b	2.19 A
96 nodes	48 spurs × 2 nodes	0.0 h	1.02 f	2.18 e	4.23 c	6.41 a	2.76 A
	24 spurs × 4 nodes	0.0 h	1.13 f	2.20 e	4.43 c	6.38 a	2.82 A
	16 spurs × 6 nodes	0.0 h	1.05 f	2.25 e	3.98 d	6.55 a	2.76 A
Means		0.0 E	0.89 D	1.91 C	3.79 B	5.40 A	
Data in each column are not significant at 5 % have the same letters.							

9- Decay percentage:

Regarding the effect of storage periods, the findings indicated that in **Table (9),** the decay percentage of Midnight Beauty grapevine increased gradually and significantly as the Clusters during cold storage at (5 ° C and 85% RH) for 20 days was extended in the 2022 and 2023 seasons. Data revealed that decay percentage start after 10 days of cold storage for all treatments. It is clear for Clusters from vines have 72 nodes which has a big value in reduced decay percentage flowed by 48 nodes in vines the last one is for 96 nodes per vine

This may be done that clusters coming from 96 nodes were little compacted than others come from 48 nods or 72 nodes as known compact Cluster has good chance to growth mold in it under storage (Jawandha, et al., 2012). Storage in low temperature reduced respiration but water vapor around barriers allows fungi to growth. Fungi

growth through berries unto at low temperature which has vigorous power to grow with big growth rate despite at low temperatures around 0 _C. As a consequence of this, its preservation is restricted and consist of many interior constituents like the maturation ratio and intensity of the pulp and skin with exterior agent with temperature and relative humidity. (Palou et al., 2010).

Table (9). Effect of cold storage on decay percentage of Midnight Beauty grapes from vines pruned at different levels of nodes during 2022 and 2023 seasons.

		Decay (%)					
	Treatments	0 days	5 days	10 days	15 days	20 days	Means
		Season 2022					
48 nodes	**24 spurs×2 nodes**	0.0 **f**	0.07 **f**	0.38 **e**	1.30 **d**	3.63 **b**	**1.07 A**
	12 spurs× 4 nodes	0.0 **f**	0.00 **f**	0.41**e**	1.25 **d**	3.74 **b**	**1.08 A**
	8 spurs × 6 nodes	0.0 **f**	0.14 **a**	0.55 **e**	1.59 **d**	4.29 **a**	**1.38 A**
72 nodes	**36 spurs×2 nodes**	0.0 **f**	0.00 **f**	0.23 **e**	0.87 **e**	2.45 **c**	**0.71 B**
	18 spurs × 4 nodes	0.0 **f**	0.00 **f**	0.44 **e**	1.31**d**	2.81**c**	**0.91 B**
	12 spurs × 6 nodes	0.0 **f**	0.00 **f**	0.26 **e**	0.91 **e**	2.39 **c**	**0.71 B**
96 nodes	**48 spurs × 2 nodes**	0.0 **f**	0.12 **f**	0.51**e**	1.48 **d**	4.20 **a**	**1.26 A**
	24 spurs × 4 nodes	0.0 **f**	0.14 **f**	0.58 **e**	1.66 **d**	4.36 **a**	**1.34 A**
	16 spurs × 6 nodes	0.0 **f**	0.09 **f**	0.42 **e**	1.54 **d**	4.25 **a**	**1.26 A**
	Means	**0.0 C**	**0.0 C**	**0.06 C**	**0.42 C**	**1.32 B**	**3.56 A**
		Season 2023					
48 nodes	**24 spurs×2 nodes**	0.0 **d**	0.00 **d**	0.36 **d**	1.36 **c**	4.37 **a**	**1.21 A**
	12 spurs× 4 nodes	0.0 **d**	0.10 **d**	0.50 **d**	1.25 **c**	4.00 **a**	**1.17 A**
	8 spurs × 6 nodes	0.0 **d**	0.10 **d**	0.51 **d**	1.58 **c**	4.53 **a**	**1.34 A**
72 nodes	**36 spurs×2 nodes**	0.0 **d**	0.12 **d**	0.63 **d**	1.08 **c**	2.53 **b**	**0.87 B**
	18 spurs × 4 nodes	0.0 **d**	0.00 **d**	0.48 **d**	1.10 **c**	2.71 **b**	**0.85 B**
	12 spurs × 6 nodes	0.0 **d**	0.00 **d**	0.37 **d**	1.30 c	4.12 **a**	**1.15 A**
96 nodes	**48 spurs × 2 nodes**	0.0 **d**	0.21**d**	0.63 **d**	1.71 **a**	4.97 **a**	**1.50 A**
	24 spurs × 4 nodes	0.0 **d**	0.16 **d**	0.44 **d**	1.45 **c**	4.73 **a**	**1.35 A**
	16 spurs × 6 nodes	0.0 **d**	0.14 **d**	0.53 **d**	1.63 **c**	4.77 **a**	**1.41 A**
Means		**0.0 C**	**0.06 C**	**0.42 C**	**1.32 B**	**3.56 A**	

Data in each column are not significant at 5 % have the same letters.

10- Shatter percentage

The shatter percentage is one of the important factors affecting the quality of fruits during shipping and export, and it is included in the contracting conditions. Reducing this percentage is considered a success for the trading process. From Table10 berry shatters % was gradually increased by storage period advanced storage degree during cold storage at (5+ º C and 85% RH) for 20 days in both seasons**.** From pervious Tables 4 and 5 vines have 48 and 72 nodes/ vines give a great cluster and berry weight this due to decrease in connection between the pedicle and the clusterr and increase on shatter berries**,** while 96 nodes/ vine had low wight in clusters and berries have lower percentage in shattering and this done as the result of cell wall synthesis changes and activity of enzyme degradation during grape ripening (Nunan et al., 1998). As (Ferrara et al., 2016) hormonal balance reigns the maturity process due to shatter, polymer degradation which is catalyzed by various enzymes as cellulase (CL), polygalacturonase (PG), -galactosidase (-GAL), pectate lyase (PL) and xyloglucan endo trans glycosylase/ hydrolase.

Table (10). Effect of cold storage on shatter percentage of Midnight Beauty grapes from vines pruned at different levels of nodes during 2022 and 2023 seasons.

		Shatter (%)					
	Treatments	0 days	5 days	10 days	15 days	20 days	Means
			Season 2022				
48 nodes	24 spurs×2 nodes	0.0 **h**	1.00 **gh**	3.45 **e**	4.28 **d**	7.74 **a**	**3.29 A**
	12 spurs× 4 nodes	0.0 **h**	0.86 **gh**	2.18 **f**	5.06 **cd**	7.10 **a**	**3.04 A**
	8 spurs × 6 nodes	0.0 **h**	1.22 **g**	2.75 **f**	4.93 **cd**	7.05 **a**	**3.19 A**
72 nodes	36 spurs×2 nodes	0.0 **h**	1.39 **g**	2.52 **f**	4.67 **d**	6.75 **b**	**3.06 A**
	18 spurs × 4 nodes	0.0 **h**	1.66 **g**	3.29 **e**	4.81 **cd**	6.63 **b**	**3.27 A**
	12 spurs × 6 nodes	0.0 **h**	1.45 **g**	2.64 **f**	4.38 **d**	6.59 **b**	**3.01 A**
96 nodes	48 spurs × 2 nodes	0.0 **h**	1.64 **g**	2.88 **f**	3.64 **e**	5.09 **cd**	**2.65 B**
	24 spurs × 4 nodes	0.0 **h**	0.78 **gh**	2.79 **f**	4.13 **d**	5.87 **c**	**2.71 B**
	16 spurs × 6 nodes	0.0 **h**	0.98 **gh**	2.35 **f**	4.63 **d**	5.64 **c**	**2.72 B**
	Means	**0.0 E**	**1.22 D**	**2.76 C**	**5.50 B**	**6.49 A**	
			Season 2023				
48 nodes	24 spurs×2 nodes	0.0 **h**	1.21 **g**	2.99 **f**	4.40 **d**	7.13 **a**	**3.14 A**
	12 spurs× 4 nodes	0.0 **h**	1.13 **g**	3.20 **e**	4.21 **d**	6.88 **ab**	**3.08 A**
	8 spurs × 6 nodes	0.0 **h**	1.15 **g**	3.12 **e**	4.28 **d**	7.00 **a**	**3.11 A**
72 nodes	36 spurs×2 nodes	0.0 **h**	0.81 **h**	2.06 **f**	3.40 **e**	6.11 **b**	**2.47 B**
	18 spurs × 4 nodes	0.0 **h**	1.20 **g**	3.12 **e**	4.40 **d**	6.18 **b**	**2.98 A**
	12 spurs × 6 nodes	0.0 **h**	0.85 **h**	2.42 **f**	4.11 **d**	6.25 **b**	**2.72 B**
96 nodes	48 spurs × 2 nodes	0.0 **h**	1.01 **h**	2.59 **f**	3.69 **e**	5.43 **c**	**2.59 B**
	24 spurs × 4 nodes	0.0 **h**	0.85 **h**	2.38 **f**	3.52 **e**	5.38 **c**	**2.43 B**
	16 spurs × 6 nodes	0.0 **h**	0.73 **h**	2.56 **f**	3.73 **e**	5.71 **c**	**2.54 B**
	Means	**0.0 D**	**0.99 D**	**2.71 C**	**3.97 B**	**6.23 A**	

Data in each column are not significant at 5 % have the same letters.

11- Bunch Freshness

Regarding the effect of storage periods, the findings indicated that in **Table (11),** the bunch freshness of Midnight Beauty grapevine increased gradually and significantly as the during cold storage at (5 ^{o} C and 85% RH) for 20 days was extended in the 2022 and 2023 seasons. Clusters from 48 nodes/vine have a good quality in the end storage in the first season but in the second season 72 nodes/vine suggesting good quality, while, 96 nodes/vine is a wrest treatment in the two seasons with nonmarket appearance.

In spite of the fact that grapes known that has a low respiration average after harvest and the layer of cuticular wax rules water motion between the epidermal cells and the ambient atmosphere (Riederer and Schreiber, 2001). Some transformations in state of water or on the content can be taking charge of changes in the metabolism of grape bunches (Goñi, et al. 2011). Furthermore, rachis shortage the solid epidermis and cuticular wax buildup that protect berries against dehydration. Therefore, losses in water of 2% to 3% are enough to make rachis show indicator of browning (Crisosto et al., 1994). That impacts marketing which the condition of rachis grapes, in terms of color and appearance, is a good sign of postharvest quality.

Table (11). Effect of cold storage on bunch freshness percentage of Midnight Beauty grapes from vines pruned at different levels of nodes during 2022 and 2023 seasons.

Treatments		Bunch Freshness					
		0 days	5 days	10 days	15 days	20 days	Means
Season 2022							
48 nodes	24 spurs×2 nodes	1.00 a	1.00 a	1.17 b	1.50 d	2.83 d	1.50 B
	12 spurs× 4 nodes	1.00 a	1.00 a	1.16 b	2.10 c	3.17 c	1.68 B
	8 spurs × 6 nodes	1.00 a	1.17 a	1.50 a	2.67 a	3.83 a	2.03 A
72 nodes	36 spurs×2 nodes	1.00 a	1.50 a	2.00 b	3.17 a	4.00 a	2.33 A
	18 spurs × 4 nodes	1.00 a	1.17 a	1.67 c	2.67 c	3.67 b	2.03 A
	12 spurs × 6 nodes	1.00 a	1.33 a	1.84 bc	2.33 b	3.83 a	2.06 A
96 nodes	48 spurs × 2 nodes	1.00 a	1.33 a	2.67 a	3.00 a	4.00 a	2.40 A
	24 spurs × 4 nodes	1.00 a	1.33 a	2.67 a	3.17 a	4.00 a	2.43 A
	16 spurs × 6 nodes	1.00 a	1.17 a	1.50 a	2.83 a	4.00 a	2.10 A
Means		1.00 E	1.22 D	1.79 C	2.60 B	3.70 A	
Season 2023							
48 nodes	24 spurs×2 nodes	1.00 d	1.17 cd	1.33 c	2.38 b	3.51 a	1.87 A
	12 spurs× 4 nodes	1.00 d	1.33 d	2.00 b	3.00 a	3.83 a	2.23 A
	8 spurs × 6 nodes	1.00 d	1.33 d	1.83 c	2.67 b	3.71 a	2.10 A
72 nodes	36 spurs×2 nodes	1.00 d	1.00 d	1.17 cd	2.00 b	2.78 b	1.59 B
	18 spurs × 4 nodes	1.00 d	1.00 d	1.17 cd	1.83 c	2.81 b	1.56 B
	12 spurs × 6 nodes	1.00 d	1.00 d	1.33 c	2.17 b	2.83 b	1.66 B
96 nodes	48 spurs × 2 nodes	1.00 d	1.33 c	2.67 b	3.00 a	4.00 a	2.40 A
	24 spurs × 4 nodes	1.00 d	1.33 c	2.67 b	3.17 a	4.00 a	2.43 A
	16 spurs × 6 nodes	1.00 d	1.17 cd	1.60 c	2.91 b	4.00 a	2.13 A
Means		1.00 D	1.18 C	1.75 C	2.56 B	3.46 A	

Data in each column are not significant at 5 % have the same letters.

12- Change of grape quality during cold storage

During storage period TSS in Midnight Beauty grapes increased slightly after 5 days of cold storage to rich maximum value after 15 days after then reduced. That clear in Table 12 Clusters from vines loaded 96 nods/ vine have highest level accumulations on TSS in the end storage flowed by Clusters from vines loaded 72 nodes /vines while the lowest for clusters from vines loaded 48 nodes / vine. That is clear in first season more than the second season. Increases on TSS coming from alteration of acids to sugars, with loss in water (Sha et al., 2022). Transpiration leads to evaporation, which leads to water loss from the cells, so concentration occurs in TSS increase (Machado et al., 2022).

Respecting the effect of cold storage **Table (13)** showed a gradual decrease in acidity (%) of Midnight Beauty grapes 15 days of cold storage and then increase up to 20 days of cold storage period in 2022 and 2023 seasons. A cluster comes from vines pruned with 96 nodes (48 spurs × 2 nodes) decreases acidity in the end storage than other treatments with a moral difference with other treatments. Decreases in total acidity levels on storage period may be assign to an increase in physiological membrane permeability, appeared that acids stored in cell vacuoles are being respired and changed into sugars (Nasser et al., 2022). Similar results to TSS found in TSS /acid ratio prompter that tabled in Tables14. This indicates that storage conditions keep quality in this variety.

Table (12). Effect of cold storage on T.S.S percentage of Midnight Beauty grapes from vines pruned at different levels of nodes during 2022 and 2023 seasons.

Treatments		T.S.S (%) 0 days	5 days	10 days	15 days	20 days	Means
Season 2022							
48 nodes	**24 spurs×2 nodes**	17.00 **cd**	17.10 c	17.23 **b**	17.33 **ab**	17.20 **b**	17.17 **B**
	12 spurs× 4 nodes	17.00 **cd**	17.15 c	17.20 **b**	17.30 **a**	17.23 **b**	17.17 **B**
	8 spurs × 6 nodes	16.67 **d**	16.73 **d**	16.81 **d**	17.00 **cd**	17.00 **cd**	16.84 **C**
72 nodes	**36 spurs×2 nodes**	17.00 **cd**	17.12 **c**	17.18 **c**	17.25 **b**	17.20 **b**	17.15 **B**
	18 spurs × 4 nodes	17.67 **cd**	17.70 **a**	17.73 **a**	17.85 **a**	17.70 **a**	17.73 **A**
	12 spurs × 6 nodes	17.00 **cd**	17.12 **c**	17.15 **c**	17.30 **ab**	17.00 **cd**	17.11 **B**
96 nodes	**48 spurs × 2 nodes**	18.00 a	18.00 **a**	18.13 **a**	18.21 **a**	18.00 **a**	18.06 **A**
	24 spurs × 4 nodes	17.33 **a**	17.37 **ab**	17.41**ab**	17.50 **ab**	17.47 ab	17.40 **B**
	16 spurs × 6 nodes	17.33 **ab**	17.37 **ab**	17.43 **ab**	17.50 **ab**	17.41 **ab**	17.40 **B**
	Means	17.22 **A**	17.29 **A**	17.36 **A**	17.47 **A**	17.35 **A**	
Season 2023							
48 nodes	**24 spurs×2 nodes**	17.00 **ab**	17.08 **a**	17.20 **a**	17.33 **a**	17.24 **a**	**17.21 A**
	12 spurs× 4 nodes	16.67 **c**	16.80 **b**	16.91 **b**	17.00 **ab**	17.00 **ab**	**16.87 A**
	8 spurs × 6 nodes	17.00 **ab**	17.12 **a**	17.23 **a**	17.38 **a**	17.18 **a**	**17.18 A**
72 nodes	**36 spurs×2 nodes**	16.67 **c**	16.77 **b**	16.90 **b**	17.05 **a**	16.95 **b**	**16.86 A**
	18 spurs × 4 nodes	16.83 **b**	16.90 **b**	17.03 **ab**	17.10 **a**	17.00 **ab**	**16.97A**
	12 spurs × 6 nodes	16.50 **c**	16.60 **c**	16.68 **c**	16.81 **b**	16.70 **b**	**16.65 B**
96 nodes	**48 spurs × 2 nodes**	16.83 **b**	16.90 **b**	17.00 **ab**	17.00 **ab**	16.85 **b**	**16.91 A**
	24 spurs × 4 nodes	16.67 **c**	16.75 **b**	16.90 **b**	17.00 **ab**	16.85 **b**	**16.83 A**
	16 spurs × 6 nodes	17.00 **ab**	17.08 **a**	17.20 **a**	17.29 **a**	17.00 **ab**	17.11 **A**
	Means	**16.79 B**	**16.88 B**	**17.00 A**	**17.10 A**	**16.97 A**	
Data in each column are not significant at 5 % have the same letters.							

Table (13). Effect of cold storage on titratable acidity percentage of Midnight Beauty grapes from vines pruned at different levels of nodes during 2022 and 2023.

Treatments		Total acidity (%) 0 days	5 days	10 days	15 days	20 days	Means
Season 2022							
48 nodes	**24 spurs×2 nodes**	0.80 **a**	0.78 **b**	0.75 **b**	0.74 **b**	0.77 **b**	**0.76 B**
	12 spurs× 4 nodes	0.80 **a**	0.78 **b**	0.74 **b**	0.71 **b**	0.73 **b**	**0.75 B**
	8 spurs × 6 nodes	0.80 **a**	0.80 **a**	0.76 **b**	0.72 **b**	0.74 **c**	**0.74 B**
72 nodes	**36 spurs×2 nodes**	0.77 **b**	0.74 **b**	0.72 **b**	0.68 **c**	0.70 **c**	**0.72 B**
	18 spurs × 4 nodes	0.80 **a**	0.79 **b**	0.75 **b**	0.72 **b**	0.73 **b**	**0.75 B**
	12 spurs × 6 nodes	0.77 **b**	0.75 **b**	0.71 **b**	0.67 **c**	0.70 **c**	**0.72 B**
96 nodes	**48 spurs × 2 nodes**	0.73 b	0.70 **b**	0.66 **c**	0.63 **d**	0.65 **c**	**0.67 C**
	24 spurs × 4 nodes	0.87 **a**	0.86 **a**	0.83 **a**	0.78 **b**	0.80 **a**	**0.82 A**
	16 spurs × 6 nodes	0.80 **a**	0.79 **b**	0.75 **b**	0.72 **b**	0.76 **b**	**0.76 B**
	Means	**0.79 A**	**0.77 A**	**0.74 A**	**0.70 B**	**0.73 A**	
Season 2023							
48 nodes	**24 spurs×2 nodes**	0.73 **a**	0.70 **a**	0.68 **b**	0.65 **b**	0.67 **b**	**0.68 B**
	12 spurs× 4 nodes	0.68 **b**	0.66 **b**	0.62 **c**	0.64 **b**	0.65 **b**	**0.65 C**
	8 spurs × 6 nodes	0.68 **b**	0.65 **b**	0.62 **c**	0.60 **d**	0.63 **c**	**0.63 D**
72 nodes	**36 spurs×2 nodes**	0.72 **a**	0.70 **a**	0.65 **b**	0.66 **b**	0.67 **b**	**0.68 B**
	18 spurs × 4 nodes	0.68 **b**	0.67 **b**	0.63 **c**	0.64 **b**	0.65 **b**	**0.65 C**
	12 spurs × 6 nodes	0.75 **a**	0.73 **a**	0.70 **a**	0.71 **a**	0.72 **a**	**0.72 A**
96 nodes	**48 spurs × 2 nodes**	0.72 **a**	0.69 **b**	0.64 **b**	0.66 **b**	0.68 **b**	**0.67 B**
	24 spurs × 4 nodes	0.75 **a**	0.73 **a**	0.68 **b**	0.70 **a**	0.72 **a**	**0.71 A**
	16 spurs × 6 nodes	0.68 **b**	0.66 **b**	0.60 **d**	0.61 **c**	0.63 **c**	**0.63 D**
	Means	**0.71 A**	**0.68 B**	**0.64 C**	**0.65 C**	**0.66 B**	
Data in each column are not significant at 5 % have the same letters.							

Table (14). Effect of cold storage on T.S.S / Acid ratio percentage of Midnight Beauty grapes from vines pruned at different levels of nodes during 2022 and 2023.

Treatments		0 days	5 days	10 days	15 days	20 days	Means
TSS/Acid ratio							
Season 2022							
48 nodes	24 spurs×2 nodes	21.25 **f**	21.92 **f**	22.97 **e**	23.41 **d**	22.33 **e**	**22.37 C**
	12 spurs× 4 nodes	21.25 **f**	21.98 **f**	23.24 **d**	23.94 **d**	23.60 **d**	**22.80 C**
	8 spurs × 6 nodes	20.83 **g**	20.91 **g**	22.11 **e**	24.13 **c**	22.97 **e**	**22.19 C**
72 nodes	36 spurs×2 nodes	22.07 **e**	23.13 **d**	23.86 **d**	25.07 **b**	24.57 **c**	**23.74 B**
	18 spurs × 4 nodes	22.08 **e**	22.40 **e**	23.64 **d**	23.75 **d**	24.24 **c**	**23.59 B**
	12 spurs × 6 nodes	22.07 **e**	22.82 **e**	24.15 **c**	25.09 **b**	24.28 **c**	**23.68 B**
96 nodes	48 spurs × 2 nodes	24.65 **c**	25.71 **b**	27.46 **a**	21.79 **f**	27.68 **a**	**25.45 A**
	24 spurs × 4 nodes	19.91**h**	20.19 **g**	20.97 **g**	24.01 **c**	21.83 **f**	**21.38 D**
	16 spurs × 6 nodes	21.66 **f**	21.98 **f**	22.97 **e**	23.41 **d**	22.33 **e**	**22.47 C**
	Means	**21.75 B**	**22.33 A**	**23.48 A**	**23.84 A**	**23.75 A**	
Season 2023							
48 nodes	24 spurs×2 nodes	23.28 **e**	24.4 **d**	25.29 c	26.66 **b**	25.73 **c**	**25.07 B**
	12 spurs× 4 nodes	24.51 **d**	25.45 **c**	27.27 a	26.56 **b**	26.15 **b**	**25.98 B**
	8 spurs × 6 nodes	25.0 **c**	26.33 **b**	27.79 a	28.96 **a**	27.26 **a**	**27.06 A**
72 nodes	36 spurs×2 nodes	23.15 **e**	23.95 **e**	26.00 b	25.83 **c**	25.29 **c**	**24.84 B**
	18 spurs × 4 nodes	24.75 **d**	25.22 **c**	27.03 a	26.71 **b**	26.15 **b**	**23.94 C**
	12 spurs × 6 nodes	22.00 **f**	22.73 **f**	23.82 e	23.70 **e**	23.19 **e**	**23.08 C**
96 nodes	48 spurs × 2 nodes	23.37 **e**	24.49 **d**	26.56 **b**	25.75 **c**	24.77 **d**	**24.98 B**
	24 spurs × 4 nodes	22.22 **f**	22.94 **f**	24.85 **d**	24.28 **d**	23.40 **e**	**23.53 C**
	16 spurs × 6 nodes	25.00 **c**	25.87 **c**	28.66 **a**	28.50 **a**	26.98 **b**	**27.00 A**
	Means	**23.69 B**	**24.59 B**	**23.36 B**	**26.32 A**	**25.43 A**	

Data in each column are not significant at 5 % have the same letters.

CONCLUSION:

According to the above findings, there is a relationship between the yield and physiochemical characteristics of clusters and berries and the different pruning levels. The number of clusters and yield per vine increased gradually as pruning per vine increased from 48 nodes per vine to 72 nodes per vine or 96 nodes per vine, while the physiochemical properties of clusters and berries gradually decreased. so, it can be recommended that pruning Midnight Beauty grapevine at 48 nodes/vine (24 spurs×2 nodes) gave the maximum values of bud behaviour, vegetative growth parameters, and berry physical and dormant season parameters, while vines pruned at 96 (48 spurs × 2 nodes) gave the highest yield per vine. All treatment gives good quality in cold storage.

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الملخص العربى

تأثير مستويات حمولة البراعم وطول وحدة الاثمار على النمو والإنتاجية وجودة الثمار وقابلية تخزين العناقيد تحت التخزين البارد لعنب ميدنايت بيوتي

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اجريت هذه الدراسة على مدي موسمين 2022 و2023 في مزرعة خاصة بمدينة السادات بمحافظة المنوفية. الكرمات منزرعة في تربة رملية على مسافات 2 × 3 متر تروي بالتنقيط وقلمت الكرمات دابريا في آخر ديسمبر ونظام التدعيم المتبع هو نظام الجيبل. تم التقليم على ثلاث مستويات 48 و72 و96 عين لكل كرمة مع ثلاث مستويات لطول الدابرة (2و 4 و6) عين لكل دابرة على صنف عنب ميد نايت بيوتي. أظهرت النتائج زيادة عدد العناقيد والمحصول لكل كرمة تزداد تدريجيًا مع زيادة حمولة البراعم من 48 عين إلى 72 الى 96 عين لكل كرمة، بينما انخفضت الخصائص الفيزيائية والكيميائية للعناقيد والحبات تدريجيًا. لذلك، يمكن التوصية بأن تقليم كرمات صنف عنب ميد نايت بيوتي بحمولة 48 عين/كرمة (24 دابرة × 2 عين) أعطى افضل قيم لسلوك البراعم وصفات النمو الخضري وقياسات فترة السكون و الصفات الفيزيائية للعنقود والحبات ، في حين أعطت الكروم المقلمة بمقدار 96 (48 دابرة × 2 عين) أعلى محصول لكل كرمة. وقد أظهرت جميع معاملات حمولة البراعم لكل كرمة جودة العناقيد تحت ظروف التخزين، كما سجلت أقل نسبة معنوية لفقدان وزن الثمار و اعفان الثمار من الكروم المقلمة 72 عين لكل كرمة (18 دابرة × 4 عين)، بينما سجلت العناقيد من الكروم المقلمة عند 96 (48 دابرة × 2 عين) انخفاضاً في نسبة الفرط والحموضة الكلية مع زيادة المواد الصلبة الذائبة الكلية.