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EFFECT OF DORCY ON BUD BEHAVIOR,YIELD AND FRUIT QUALITY OF THOMPSON SEEDLESS GRAPES .

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ABSTRACT

This study was conducted during 2000 and 2001 seasons on Thompson Seedless grapevine grown in clay loam soil to examine the effect of spraying Dorcy (49% hydrogen cyanamide) at 2%,4% or 5% on two dates (10th of Jan. and 1st of Feb). These treatments were carried out to study the effect of Dorcy on bud behavior, yield and fruit quality.

Results showed that spraying Dorcy on the 10th of Jan gave earliness in the beginning of bud burst by about 21 and 24 days compared with the control during the two seasons. Bud burst percentage reached about 50% as a result of Dorcy spraying on 10th of Jan by about 18,24 days than the control and by about 6,7 days than the Dorcy treatments on the 1st of Feb. during the two seasons of study respectively. All applications hastened bud burst, fertility and leaf area. Number of bunches per vine, bunch weight and length were increased and lead to increase yield per vine by about 34.2 and 33.7% over the control during the two seasons of study respectively when vines were sprayed with Dorcy at 5% on 1st of Feb.

Fruit quality (berry weight,size,T.S.S,T.S.S acid ratio and total sugar) and total carbohydrates were increased by all treatments while the acidity was decreased.

INTRODUCTION

Under the Egyptian weather conditions, insufficient chilling hours in winter delay leaf drop; Moreover many buds remain dormant, furthermore blooming period is extended for a long time. Therefore using dormancy breaking agents is a must. Dorcy (hydrogen cyanamide) is one of the plant growth regulators which lead to earlier and more uniform bud burst,earlier fruit setting and early fruit ripening(Lin *et al* 1983 and Schulman *et al* 1983).The effectiveness of this chemical depend on the rate and time of application, stage of bud development,post application temperatures and amount of chilling accumulated (Erez,1971 ;Erez ,1979 and Schulman *et al* 1986).

This investigation aimed to study the effect of Dorcy applied at different concentrations and different dates during the dormant season after winter pruning on Thompson Seedless grapevines.

MATERIAL AND METHODS

The present study was carried out during 2000 and 2001 seasons in a private vineyard located in Besindila, Dakahlia governorate.Thompson Seedless grapevines of 15 year-old were grown in a clay loam soil at 2x3 meters apart and cane trained. The vines received the normal agricultural practices as in the commercial grape orchards under Dakahlia conditions.

Vines were pruned during the first week of Jan 2000 and 2001 leaving 72 buds/vines.

During each season 63 vines of almost similar vigour were selected and arranged in randomized block design 3 vines were selected at random and replicated 3 times to receive of the following treatments:-

1- Control (sprayed with water and Triton at 0.1%).
2- Dorcy 50 (hydrogen cyanamide,(H2CN2) 49%) at 2% at 10 January.
3- Dorcy 50 at 4% on the 10th of January.
4- Dorcy 50 at 5% on the 10th of January.
5- Dorcy 50 at 2% on the 1st of February.
6- Dorcy 50 at 4% on the 1st of February.
7- Dorcy 50 at 5% on the 1st of February.

The canes of each vine were sprayed with half liter of the assigned solution to be completely witted and Triton at 0.1% was add to the solution.

The following parameters were considered to evaluate the effect of different treatments:-

1- Bud behavior:

The effect of Dorcy 50 on the dynamics of bud burst percentage was studied by recording the bud burst percentage every three days from the beginning of bud burst. Moreover, the number of bursted buds on one year old canes and the number of clusters per vine were recorded, the percentage of bud burst and fertility were calculated as follows:-

Bud burst % = Bursted bud / total number of buds per

Vine X 100.

Fertility% =number of clusters per vine / total number of Buds per Vine left at pruning time X !00.

2- Leaf area :-

The leaf area was measured in the middle part of the shoot during the first week of July according to (Jain and Misra,1966).

3- Number of bunches and yield :-

At harvest time, (the end of July) bunches were picked in each season.The total number of bunches and their weights were recorded .

4- Bunch quality and berry characteristics :-

At harvest time, samples of 27 bunches per each treatment were taken to determine the following data :-

1- Average bunch weight in gms.
2- Average bunch length in cms.
3- Average bunch wide in cms.

From each treatment, three samples each containing loo berries were used for physical and chemical determinations : berry weight, volume and diminsion, percentage of the total soluble solids,titratable acidity,T.SS. acid ratio and total sugars. Samples of one year old canes which bore bunches

were collected at winter pruning (one per each vine) the and total carbohydrates (%) were determined according to the method described by Plumer (1971).

The data obtained were statistically analyzed as a randomized complete block design according to Snedecor and Cochran (1967).

RESULTES AND DISCUSSION

BUD behavior :-

Dynamics of bud burst percentage:-

Data presented in Figs(1and2) show that all treatments used hastened the beginning of bud burst than the untreated ones. Moreover, Dorcy at 2 , 4 or 5 % concentration sprayed on the 10th of Jan. gave earliness in the beginning of bud burst by about 18-21 days in the first season and 21-24 days in the second one compared to the control. It is also clear that Dorcy treatments on the 10th of Jan. were superior than the other Dorcy applications on the 1st of Feb with about 9 and 12 days in the first and second season respectively .

Bud burst percentage reached about 50% as a result of Dorcy applications on the 10th of Jan. by about 18,24 days than the control and by about 6,7 days than the Dorcy treatments on the 1st of Feb. during the two seasons of the study, respectivelly earliness in bud burst with Dorcy (hydrogen cyanamide H2CN2) applications may be due to its role in increasing the rate of respiration,measured as CO_2 evaluation and by reducing catalase activity as mention by Shulman *et al* (1983). Similar effects were reported by Williams (1987), Zelleke *et al* (1989), Poni *et al* (1990),Mancillay (1996), Sallam (1997) and EL-Shahat *et al* (2002) .

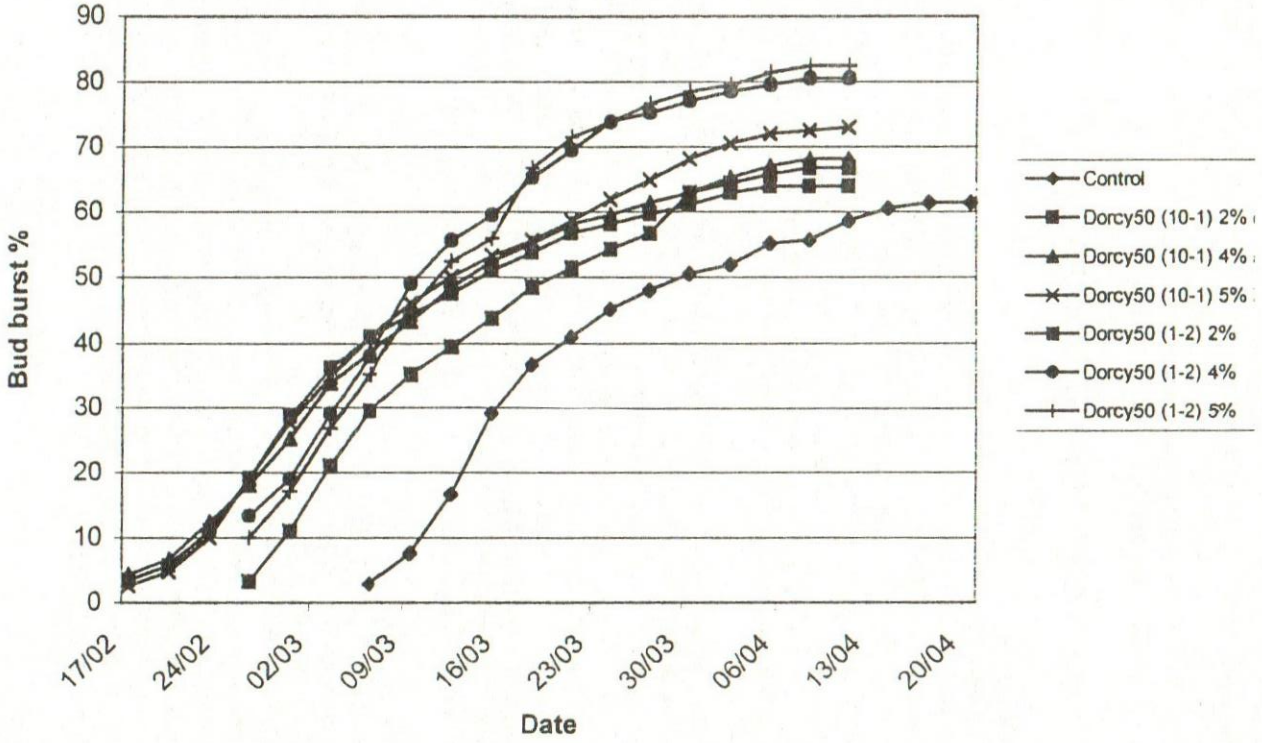
Bud burst percentage :-

It is clear from Table(1) that Dorcy applications at the two of application dates and the three concentrations used had resulted in a significant increase in bud burst. Furthermore, Dorcy application at 5% on the 1st of Feb. gave the most pronounced effect in this respect compared to the other treatments or the control.These results may be due to Cyanide and Cyanamide which are known to inhibit catalase enzyme and promote mitochondrial respiration(Taylorson and Hendriks, 1997) and Shulman *et al* (1983). Both compounds contain the very reactive C≡N group which reacts with the enzyme-Fe of catalase thus inhibiting the H_2O_2 decomposition which is poisonous to plant cells (Hendricks and Taylorson , 1975) .

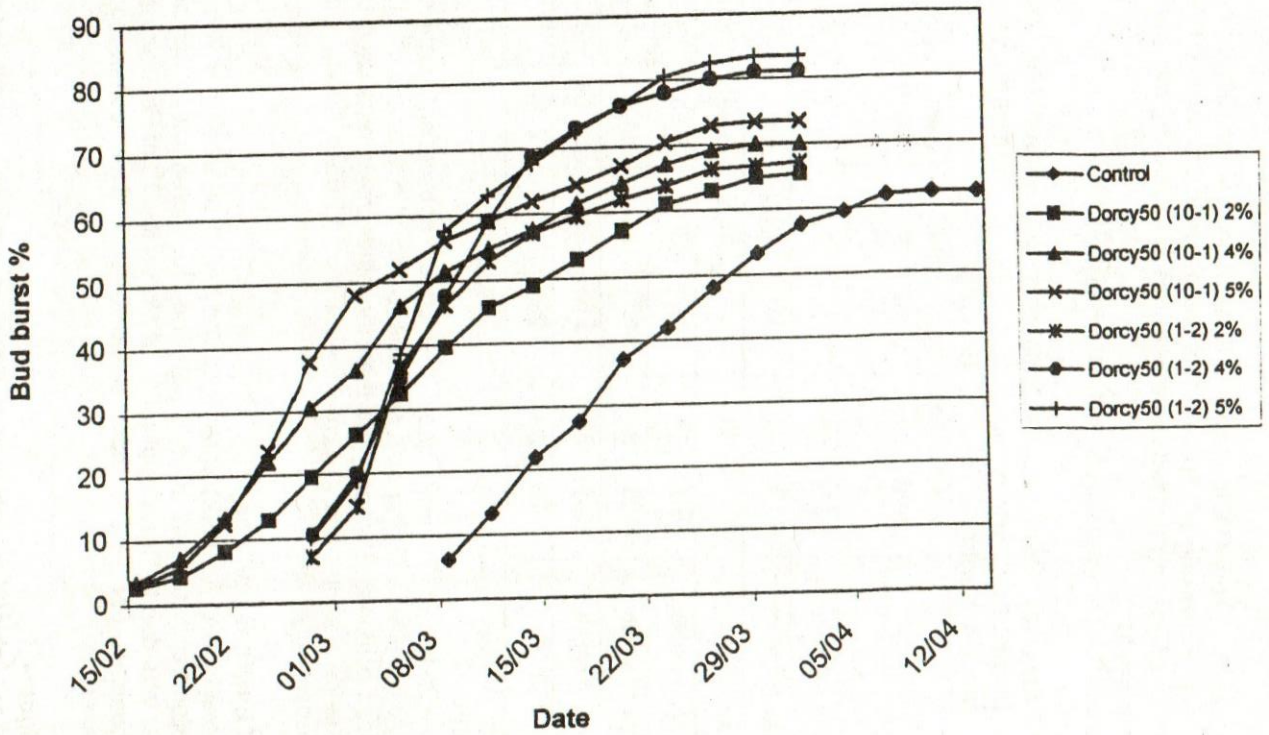
Bud fertility :-

It is clear that spraying vines with Dorcy on the 10th of Jan. and the 1st of Feb. significantly increased bud fertility in comparison with the control. Moreover, the highest values in this respect were obtained from vines treated with Dorcy at 5% on the 1st of Feb. These results agree with those found by Poni *et al* (1990);Miele (1991); Tourky *et al* (1995) and Sallam (1997).

Figer(1): The Effect of Dorcy 50 on Dynamics of Bud Burst (%) on Thompson seedless at 2000 season .



Figer(2): The Effect of Dorcy 50 on Dynamics of Bud Burst (%) on Thompson seedless at 2001 season .



Leaf area :-

As shown in Table (1), it is evident that spraying vines with Dorcy was very effective in increasing the leaf area as compared to the control. Dorcy at 5% on the 10th 0f Jan. surpassed the other ones in increasing the leaf area. These results are in agreement with Tourky *et al* (1995) and Sallam (1997).

Table (1): Effect of Dorcy 50 applications on percentage of bud burst , bud fertility and leaf area of Thompson Seedless grapes during 2000 and 2001 seasons .

Treatments	Bud burst%		Bud fertility%		Leaf area (cm2)	
	2000	2001	2000	2001	2000	2001
Control	61.4	62.3	22.9	23.1	76.29	78.75
Dorcy 2% on the 10th of Jan	63.8	65.3	52.2	27.1	80.16	83.07
Dorcy 4% on the 10th of Jan	68.1	70.0	28.6	29.5	86.17	87.22
Dorcy 5% on the 10th of Jan	72.9	73.4	29.1	30.0	87.45	88.84
Dorcy 2% on the 1st of Feb	66.7	67.1	28.1	30.0	80.53	82.79
Dorcy 4% on the 1st of Feb	80.5	81.0	34.3	35.2	84.03	87.13
Dorcy 5% on the 1st of Feb	82.4	83.3	35.6	35.7	84.49	87.73
L.S.D at 5%		2.14	1.28	2.21	2.44	3.19

Yield per vine :-

Data presented in Table(2) show that Dorcy applications significantly increased yield per vine during both seasons. Dorcy at 5% on the 1st of Feb. also produced a higher yield per vine than the other treatments used or the check one,since this treatment gave 10.49% and 11.03kg during the two seasons respectively.

Number of bunches per vine :-

Data presented in Table(2) show that number of bunches per vine took almost similar trend in case of yield per vine.The increment of number of bunches per vine due to Dorcy application at 5% on the 1st of Feb.were about 9 and 8 bunches per vine in both seasons respectively compared with untreated vines.

Bunch weight :-

Data from Table(2) revealed that Dorcy applications at 4% and 5% significantly increased bunch weight compared with the control in both seasons.

Table (2) : Effect of Dorcy 50 applications on yield, number of bunches, bunch Weight and length of Thompson Seedless grapes uring 2000 and 2001 seasons .

Treatments	Berry weight (gm)		Berry size (ml)		Berry length (cm)		Berry diameter(mm)	
	2000	2001	2000	2001	2000	2001	2000	2001
Control	1.31	1.35	1.14	1.17	1.39	1.37	1.20	1.20
Dorcy 2% on the 10th of Jan	1.44	1.47	1.29	1.28	1.44	1.46	1.24	1.25
Dorcy 4% on the 10th 0f Jan	1.65	1.67	1.49	1.50	1.51	1.52	1.28	1.29
Dorcy 5% on the 10th of Jan	1.71	1.76	1.55	1.53	1.49	1.51	1.27	1.28
Dorcy 2% on the 1st of Feb	1.46	1.51	1.32	1.33	1.51	1.44	1.24	1.24
Dorcy 4% on the 1st of Feb	1.72	1.75	1.54	1.55	1.50	1.52	1.28	1.30
Dorcy 5% on the 1st of Feb	1.73	1.77	1.56	1.56	1.50	1.51	1.28	1.29
L.S.D at 5%	0.16	0.13	0.15	0.11	0.037	0.035	0.03	0.027

Bunch length :-

It is obvious from Table(2) that bunch length took similar trend to those found with bunch weight.

From the above characters, it could be concluded that the effect of Dorcy on increasing the yield per vine was gained through its effect on increasing both number of bunches and its weight through increasing both bud burst and fertility percentage which produced shoots bearing the clusters (EL-Shaht 1992 ; Sallam , 1997). Our data are in harmony with those reported by Nir *et al* (1988); Miele (1991) ; Ayaad (1992) ; EL-Sayed (1994) and Tourky *et al* (1996).,they found that hydrogen cyanamide applications increased number of bunches, bunch weight and yield than the untreated vines.

Berry weight, size and dimension: -

Table(3) show an increase in berry weight, size and dimension, with all Dorcy applications in comparison with the check vines . The highest values in this respect resulted from the treatments of Dorcy at 5% on the 1st of Feb.These increment would be expected since hydrogen cyanamide is rapidly broken down into urea,ammonium and nitrate,Thus,acting as a fertilizer (Vilsmeir,1977).The obtained data are in general agreement with those found by Lotfy (1993);Rizk and Rizk(1994) Tourky *et al* (1996).

Table (3) : Effect of Dorcy 50 applications on berry weight, size, length and diameter of Thompson Seedless grapes during 2000 and 2001 seasons .

Treatments	Yield (kg)		Number of bunches		Bunch weight (gm)		Bunch length (cm)	
	2000	2001	2000	2001	2000	2001	2000	2001
Control	5.51	5.92	16.0	17.0	344	356	19	20
Dorcy 2% on the 10th of Jan	6.48	7.18	18.0	19.0	365	378	21	21
Dorcy 4% on the 10th of Jan	8.25	8.68	20.0	21.0	412	420	23	23
Dorcy 5% on the 10th of Jan	8.31	8.92	20.0	21.0	410	424	23	22
Dorcy 2% on the 1st of Feb	7.58	8.36	20.0	21.0	386	398	20	21
Dorcy 4% on the 1st of Feb	10.29	10.77	24.0	25.0	422	437	24	24
Dorcy 5% on the 1st of Feb	10.49	11.03	25.0	25.0	425	441	24	24
L.S.D at 5%	0.783	0.867	0.898	0.545	25.996	21.759	1.694	1.589

Total soluble solids, acidity, T.S.S / Acid ratio and total sugars:-

Data presented in Tables (4&5) indicated that all treatments significantly increased T.S.S percentage in comparison with the control. Moreover, the highest T.S.S percentage resulted from spraying Dorcy at 5% on the 10th of Jan. during the two seasons of study.

Table (4) : Effect of Dorcy 50 applications on T.S.S%.acidity and T.S.S/acid ratio of Thompson Seedless grapes during 2000 and 2001 seasons .

Treatments	T.S.S (%)		Acidity (%)		T.S.S/acid Ratio	
	2000	2001	2000	2001	2000	2001
Control	16.2	16.8	0.820	0.770	19.96	21.17
Dorcy 2% on the 10th of Jan	17.4	18.0	0.730	0.710	23.90	25.36
Dorcy 4% on the 10th of Jan	18.4	19.0	0.660	0.640	27.70	29.71
Dorcy 5% on the 10th of Jan	18.8	19.2	0.590	0.580	31.51	33.04
Dorcy 2% on the 1st of Feb	17.2	17.4	0.770	0.740	22.49	23.39
Dorcy 4% on the 1st of Feb	17.8	18.2	0.700	0.670	25.14	27.05
Dorcy 5% on the 1st of Feb	18.2	18.8	0.680	0.620	26.73	30.16
L.S.D at 5%	0.588	0.443	0.037	0.037	1.273	1.501

Concerning to the effect of Dorcy applications on acidity percentage at harvesting, the data generally reveal that all treatments tended to reduce the acidity percentage in the berry juice. The differences between all treatments

used and the control were significant. The least acid values due to Dorcy spraying at 5% on the 10th of Jan. during the two seasons was obtained .

In regard to the effect on the T.S.S / acid ratio and total sugars content, the data disclosed that the values of T.S.S / acid ratio and the total sugar content a took similar trend to those noticed in case of T.S.S percentage.

The obtained results are in harmony with those reported by Jordan (1985/1986), Lotfy (1993); Tourky *et al* (1996) and EL- Shahat *et al* (2002).

Total carbohydrate :-

Data in Table(5) show clearly that significant differences were detected between all Dorcy treatments under study and the control in respect to the total carbohydrates content during the two seasons.The maximum values were detected on spraying Dorcy at 5% on the 10th of Jan., Dorcy at 5% on the 1st of Feb and Dorcy at 4% on the 10th of Jan.

The increment in the total carbohydrates content of canes observed in Dorcy treatments may be attributed to the increase in leaf area Table (2), in addition to increasing in the intensity of photosynthesis in leaves as well as the great accumulation of organic mineral nutrients in favour of the rest tissues of the vines (Winkler,1965).

Table (5) : Effect of Dorcy 50 applications on total sugar and Total carbohydrates of Thompson Seedless grapes During 2000 and 2001 seasons .

Treatments	Total sugars (%)		Total carbohydrates (%)	
	2000	2001	2000	2001
Control	14.74	15.29	15.20	15.55
Dorcy 2% on the 10th of Jan	15.49	16.20	16.64	17.22
Dorcy 4% on the 10th of Jan	16.19	16.72	18.47	18.94
Dorcy 5% on the 10th of Jan	16.36	16.70	18.88	19.08
Dorcy 2% on the 1st of Feb	15.48	15.66	16.57	17.22
Dorcy 4% on the 1st of Feb	15.49	15.83	18.25	18.77
Dorcy 5% on the 1st of Feb	16.02	16.54	18.65	19.10
L.S.D at 5%	0.401	0.540	0.537	0.403

REFERENCES

Ayaad,H.M.(1992). Effect of hydrogen cyanamide (Dormex) and KNO3 on dud break, fruit quality and yield of Thompson Seedless grapevines .J.Agric. Res. Tanta Univ., 18:171-181.

EL-Sayed, M.A.(1994).Selecting the proper date andconcentration of spraying dormex (hydrogen cyanamide) responsible for improving bud break and productivity of Red Roomy grapevines. J. Agric.Sci Mansoura Univ., 20:855-868.

EL-Shahat, S.E.S.(1992) Bud dormancy in Thompson Seedless grape as affected by some field practices .Ph.D . Thesis Fac. Of Agric. Mansoura Univ.

EL-Shahat, S.E.S; M.H Rizk and H.M. EL-Mogy.(2002): Influence of summer pruning on improving the response of Thompson Seedless grapevines to Dormex application .J. Agric.Sci.Mansoura Univ.27(7): 4895 – 4887.

Erez,A.:Lavee,S.and Samish,R.M.(1971): Improved methods to control rest in the peach and other deciduous fruit species. *J.Amer.Soc.Hort.Sci.,96: 519-522.*

Erez,A.(1979): The effect of temperature on activity sof oil dinitro-o. cresol-spray to break the rest of apple buds. Hort. Sci.,14:141-142.

Hendricks,S.B. and Taylorson,R.B, (1975) Proc. Nat Acad Sci., 72:306-309.

Jain,T.C and D.K. Misra (1966).Methods of estimation of leaf area in crop plants. India.J.Agron.,Vol x (3).

Jordan,D.(1985/86) Early maturity, the chemical way.Grape grower (Newzealand): 59-61.

Lin,H.S.;Lin,C.H and Liaw,W.J. (1983a). The application of cyanamide on termination of dormancy in grapevine bud. 11 field test.Dept.Botany.National Chung Hsing University.

Lotfy, E.A.(1993) Response of banati grapevines to some hydrogen cyanamide treatments during dormant season. M. Sc. Fac. of Agric. Zagazig Univ.

Mancillay ,D.I.R. (1996) Effect of pruning date, concentration and application time after pruning of hydrogen cyanamide on the protection of grapevines cv.Malaga Roja buds. ITEA production Vegetal ,92: 104 – 115.(c.f Hort. Abst. 67:5773).

Miele,A.(1991) Effect of hydrogen cyanamide on bud dormancy break,vine productivity and must chemical composition in Cabernet Sauvigno grapes. Pesquisa Agropecuaria Brasilleira , 26: 315-324.

Nir,G.; Klein,I. S. And Lavee (1988). Improving grapevine bud break and yield by evaporative cooling. J. Am . Soc . Hort.Sci. 113: 512-517.

Plummer,D.T.(1971) An introduction to practical biochemistry Mc Graw. Hil book company (UK) Limited. Maidenhead. Berkshirc. England.

Poni, S.; Filippetti, I.And Zanotti, A. (1990) : Effects of dormex applications on Vitis vinifera (cv.Sangiovese) in a cold winter area . Advances in Hort. Sci., 42:121-126.

Rizk,I.A and Rizk,N.A.(1994) : Effect of hydrogen cyanamide on bud behaviour,yield,fruit quality and wood maturity of Roomy Red grapevines. Egypt.J.Apple.Sci. 9:795-813.

Sallam, A.K.(1997). Effect of some cultural practices on bud behavior and productivity of both Apples and grapes. PH.D thesis.Fac.of Agric. Mansoura Univ.

Shulman, Y.; G. Nir; L. Fanberstein and S. Lavee (1983). The effect of cyanamide on the release from dormancy of grapevines bud.Sci Hort., 19: 97-104.

Shulman,Y.; G. Nir and S. Lavee (1986). Oxidative process in bud dormancy and the uses of hydrogen cyanamide in breaking dormancy. Acta.Hort. 179:141-148.

Snedecor, G.W.and W.G. Cochran (1967).Statistical Methods 6th Ed Lowa State Univ.Press,Iowa,V.S.A.

Taylorson, R.B. and S.B. Hendricks (1977) . Ann.Rev. Plant physical.28: 331-354.

Tourky,M.N;S.S.EL-Shahat and M.H.Rizk (1995).Effects of dormex on fruit set,quality and storage life of Thompson Seedless grapes.(Banati grapes).J. Agric.Sci. Mansoura Univ . 20: 5139 – 5151.

Tourky,M.N.; S.S.EL-Shahat and M.H.Rizk (1996). Effects of dormex on fruit set,berry quality and storage life of Romi Red grapes.J.Agric.Sci.Mansoura Univ., 21: 1129 – 1141.

Vilsmeir,K.(1977).Umsetzung Von Kalkstickstoff Und dessen Metaboliten an metalloxiden in Quarzsand und Boden Ddlssertation Technische Universitat Munchen. (C.F. proceedings of "Bud dormancy on grapevines" International Seminar Uc.Davis,20 August 1984).

Williams,L.S. (1987).The effect of cyanamide on bud break and vine development of Flame Seedless grapevines in the San Joaquin Valley of California. Vitis,26: 107-113.

Winkler,A.(1965).General viticulture.Univ.Calif.Press. Berkely and Loss Angeles.

Zelleke,A.;W.M.Kliewer and A.Zelleke (1989). The effects of hydrogen cyanamide on enhancing the time and amount of bud break in young grape vine yards American Journal of Enology and viticulture.;40: 47-52.

تأثير الرش بالدورسى ٥٠ على سلوك البراعم و المحصول و صفات الثمار في العنب الطومسن سيدلس (البناتى) .

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معهد بحوث البساتين- مركز البحوث الزراعية – الجيزة.

أجريت هذة الدراسة خلال موسمي ٢٠٠٠و٢٠٠١ على كرمات عنب طومسن سيدلس (بناتي) نامية في أرض طينية وذلك لدراسة تأثير الرش بالدورسى ٥٠ (سينامید الهيدروجين ٤٩%) بتركيز ٢،٤،٥% في ميعاد المبكر في ١٠ يناير و المتأخر في أول فبراير. وكان الهدف من إجراء هذا البحث هو دراسة تأثير الرش بالدورسى على سلوك البراعم و المحصول و صفات الحبات .

وقد أوضحت النتائج أن رش الدورسى مبكرا في ١٠ يناير أدى إلى التبكير في تفتح البراعم بحوالي ٢١و٢٤ يوما مقارنة بالكنترول في موسمي الدراسة وقد أدت معاملة الكرمات بالدورسى في ١٠ يناير إلى الوصول إلى نسبة تفتح ٥٠% مبكرا بحوالى ١٨،٢٤ يوما عن الكنترول وحوالي٦،٧ يوما عن تلك المعاملة بالدورسى في أول فبراير خلال موسمي الدراسة على الترتيب. وقد أدت كل المعاملات بالدورسى إلى زيادة نسبة تفتح البراعم و الخصوبة و المساحة الورقية. وعندما تم رش الأشجار بالدورسى بتركيز ٥% في أول فبراير نتج عنة زيادة في عدد عناقيد الكرمة ووزنها وطولها مما أدى إلى زيادة في متوسط محصول الكرمة بحوالي ٩٠,٤ % ، ٨٦,٣ % زيادة عن الأشجار الغير معاملة بالدورسى خلال موسمي الدراسة على الترتيب.

أما عن جودة الثمار وقت الجمع فقد أدت جميع المعاملات إلى زيادة وزن وحجم الحبات وكذلك نسبة المواد الصلبة الذائبة وأيضا نسبتها إلى الحموضة والنسبة المئوية للسكريات الكلية بينما قلت نسبة الحموضة. كما زادت النسبة المئوية للكربوهيدرات الكلية في القصبات الحديثة .