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COMPARATIVE EFFECT OF DORMANT SEASON SPRAYS ON LECONTE PEAR TREES BLOOMING, FRUIT SET AND QUALITY IN RELATION TO HEAT

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ABSTRACT: **Hydrogen cynamide (H_2CN_2), ammonium nitrate + winter oil and urea + winter oil sprayed on 21st January in 1998 and 1999 had a pronounced effect on earliness of full blooming (F.B.) of LeConte pear trees. Blooming dates were nearly the same in control trees in spite of that bud burst (B.B.) was earlier and growing degree days (G.D.D) were higher in the second season (345 and 470 in the two seasons, respectively). Influential treatments reduced needed G.D.D. for blooming, and this was more pronounced in the second season. However, all tested treatments, in general, did not affect fruit set positively in both seasons. Control fruits matured after 130 and 132 days of F.B. after being subjected to 2199 and 2257 G.D.D. in the two seasons, respectively. Treated fruits were picked at the same day when control fruits reached maturity. As such, treated fruits were bigger, heavier, higher in total soluble solid (T.S.S.) and lower in in firmness than control ones, while the changes in acidity were not constant. The results of the investigation clarified that G.D.D. is not the major factor influencing blooming.**

Key words: pear, nitrogenous compounds, , mineral oil, H_2CN_2, blooming, fruit set, fruit quality, growing degree days (G.D.D.).

INTRODUCTION

The problem of delay and unuiform blooming of LeConte pear trees is one of the main causes of its low productivity in Egypt. Late blooming coincides with weather period favourable for the blight infections and fruit shedding (Stino,1987).

Winter sprays of H_2CN_2 advances blooming of pears (Stino, 1987; Klinac *et al.*,1991; Mann *et al.*, 1994; Moktar *et al.*, 1994), apples (Hasseeb and Elezaby, 1995; Jackson and Bepete,1995). Mixing mineral oil with H_2CN_2 was either effective (Petri and Stuker, 1995) or ineffective (Stino,1997). However, mineral oil alone delayed peach tree blooming (Call and Seely, 1989). H_2CN_2 alone or mixed with mineral oil did not affect fruit set in Anna apple (Stino,1997) and Thompson seedless vines (Tourky *et al.*, 1995). However, urea + oil decreased Anna apple fruit set (Mohamed *et al.*, 1995). Nitrogen winter sprays improved productivity of pears (Zilkah *et al.*, 2000). Relation of post-dormant requirements of temperature and pear blooming was studied by Spiegel and Alston (1979), and in apples by Gianfagna and Mehlenbucher (1985) and Warrington *et al.* (1999). However, relation of temperature to fruit set in apple and pear was investigated by Tromp and Barsloon (1994). Effect of temperature on apple fruit quality was cleared by Warrington *et al.* (1999). It has been reported that H_2CN_2 advanced the maturity of pears (Mann *et al.*,1994), apples (Hasseb and Elezaby,1995); fruit quality was also influenced.

The present work aimed to compare the physiological effect of winter spraying of some nitrogen compounds that influence dormancy with and without mineral oil with H_2CN_2, the most dominantly used dormancy breaking agent on blooming, fruit set and quality of LeConte pear trees. Relations with accumulated heat is also discussed.

MATERIAL AND METHODS

The present study was carried-out in a private pear orchard at Abou-Hommous, Behera Governorate for two successive seasons (1998 and 1999). Thirty three mature uniform LeConte pear trees budded on *Pyrus communis* were chosen each season. They were grown in a clay loamy soil, vase trained, subjected to normal management practices and flood irrigated. Eleven treatments were applied on the considered trees on 21st

January of each season. Each treatment was adopted (sprayed) on three different trees (each serving as replicate). The conducted treatments were as follows:

1) 5% commercial ammonium sulphate ($(NH_4)_2$ SO_4, 20.5% N).
2) 5% commercial ammonium sulphate + 3% winter mineral oil.
3) 5% commercial ammonium nitrate (NH_4NO_3, 33%N).
4) 5% commercial ammonium nitrate+3% winter mineral oil.
5) 5% commercial urea (CH_2 NH_2, 48%N).
6) 5% commercial urea +3% winter mineral oil.
7) 5% Agrowmore (13% N, 4%P_2O_5, 42% K_2O, and 1% MgO produced by Agro Logistic Systems, Inc. U.S.A.).
8) 5% Agrowmore + 3% winter mineral oil.
9) 3% winter mineral oil (Volk oil).
10) 1.25 % hydrogen cyanamide (Dormex, SKW, Trstborg, 49% H_2CN_2).
11) Water (Control).

0.1% Supper Film was used as a surfactant in all treatments.

Orchard studies

On each tree four representative spurs bearing branches were tagged. Apical mixed floral buds on spurs were examined at specified dates . Number of buds reaching the stages of bud burst (B.B.) and full bloom stage (F.B) (previously described by Stino, 1987) were recorded from the beginning of the first signs of activity at weekly intervals. Percentages of buds which reached the stage of F.B. in relation to the total number of examined buds at those dates were calculated. Average dates of bud burst (when 50% of the examined buds reached green tip) and full blooming (when 80% of the examined buds reached blooming) were determined for each replicate separately using the day of the year (D.Y.) system to facilitate statistical analysis. Number of days from B.B. to F.B.and from treatment to F.B.and earliness of treatment to reach F.B. in relation to the control were determined. At full bloom, the total number of flowers for each tagged branch were counted and at the stage of fruit set the intial number of set was counted and the percentage of intial fruit set was calculated as follows

Intial fruit set (%) = number of set/number of flowers x 100.

When control fruits reached maturity (7-9/8) according to indices previously determined by Stino (1957), Wali (1958) and Kilany (1982), representing samples of 10 fruits each per tree of all replicates were picked, washed with tape water, air dried and the following charcteristics were measured:

i) Physical charcteristics: average fruit weight (gm), average fruit volume (cm^3) using a graduated cylinder, and flesh firminess of peeled fruits (Kg/cm^3) using pocket pressure tester.

ii) Chemical characteristics: juice T.S.S.% (using pocket rafractometer) and juice acidity (%) (gm. malic acid/100 gm. juice) (A.O.A.C.,1980).

Thermal data:

Meteorological data for location were taken from the Central Laboratory of Climate Agricultural Research Center. Growing degree days (G.D.D.)= ? (Max.+ Min.)/2-B.T. (Munoz *et al*.,1986; Perry *et al.*,1986) where Max. is the maximum temperature of a specified date, Min. is the minimum temperature of the same day and B.T. is the base temperature = 6.1°C (Sisler and Overholser,1943). Those data were computed from date of B.B. till that of F.B. for treatments and control.

Statistical analysis:

The experiment followed the complete randomized design.The obtained data were subjected to analysis of variance (ANOVA) according to Snedcor and Cochran (1980) using Mstate Program. Means were compared by Duncan's Multiple Range test (0.05). The percentages were transformed into angles before being subjected to statistical analysis angle = Arc Sin. Sqrt percentage

RESULTS AND DISCUSSION

Percentage of Buds Reaching the Stage of Full Bloom

Data presented in Table 1 summarize the effect of conducted treatments on the percentages of buds reaching the stage of full bloom at specified dates in the two seasons of the investigation. It is evident that the highest percentage of buds that reached full bloom on 13/3 in the first season resulted from the H_2CN_2 treatment (29.4%) followed by that of ammonium nitrate + oil (12.1%). However, on

20/3 the highest percentage was achieved by the H_2CN_2 treatment (100%), ammonium nitrate + oil (98.7%), urea + oil (86.7%) and Agrowmore (79.7%) with no statistical differences between them. Nevertheless, on 27/3 buds of all treatments reached 100% full bloom.

In the second season, the stage of full bloom was reached earlier in general. It was first recorded on 5/3, where it attained 24.1% of the buds sprayed by ammonium nitrate + oil, 3.37% for those sprayed by ammonium nitrate alone and 3.27% for the H_2CN_2 sprayed. However, buds of other treatments and control did not reach full bloom in that date. Nevertheless, on 12/3 buds of H_2CN_2, ammonium nitrate, ammonium nitrate + oil, and urea + oil reached 100% full blooming. On 19/3 full blooming percentages were not changed than before, except for the ammonium sulphate + oil and the oil treatments where they reached 100%. On 26/3 buds of all treatments and the control reached 100% full bloom. Therefore, we can classify these treatments according to its effect on bud reaching full bloom stage in an ascending order as H_2CN_2, ammonium nitrate + oil, ammonium nitrate, urea + oil.

Physiological basis of the effect of N-source on reaching full bloom stage was previously investigated. The physiological effect of ammonium nitrate and hydrogen cyanamide on buds reaching full bloom stage, may be related to endogenous plant hormones synthesis, i.e. GA_s and cytokinin-like substances (Stino and Rashad, 2002). These plant hormones induce cell division of buds, which is associated with shortening the flowering period (Edwards, 1985). Pasqual and Petri (1978) mentioned that thiourea at 2% and KNO_3 treatments advanced leaf and flower bud break and shortened the flowering period. In addition, temperature plays an important role in the rate of bud growth to full bloom (Landsberg, 1979). This explains the variations among the results obtained in the two successive seasons.

Effect of Different Treatments on Earliness of Full Blooming

The effect of various treatments on the average day of the year (D.Y.) at which full blooming was reached is recorded in Table 2. Periods needed from floral bud burst (B.B.) to full bloom (F.B.) and accumulated G.D.D. in these periods are calculated (Table 3). Full blooming was reached in control trees on D.Y. 85 & 83 in the first and second years, respectively. However, time elapsed from B.B. to F.B. for control trees was 36 and 49 days with accumulated G.D.D. of 345 and 470 units in the two seasons, respectively. Hydrogen cyanamide treatment resulted in the quickest full blooming which occurred at the D.Y. 72 and 68 after 34 and 35 days from B.B. and the accumulated G.D.D. was 307 and 326 units for both seasons, respectively. This treatment caused earliness in F.B. amounting to 13 & 15 days for the two seasons, respectively compared with the control. Ammonium nitrate + mineral oil gave very close results compared with the hydrogen cyanamide treatments, as F.B. occurred at D.Y. 75 and 68. The period from B.B.to F.B was 36 and 37 days, the accumulated G.D.D. was 329 and 350 units and the earliness of F.B. compared with the control was 10 and 15 days for the two considered seasons, respectively. Urea + oil gave also considerable results as F.B. was reached at D.Y. 76 and 69 and a period of 35 and 36 days was required to reach F.B. from B.B., accumulated G.D.D. was 314 and 336 units and earliness in F.B. was 9 and 14 days compared with control in the two seasons, respectively. The results also show that adding mineral oil stimulated ammonium nitrate and urea effects in both seasons.

Although heat accumulation was higher, in general, in the second season than in the first one, yet F.B. of control buds occurred nearly at the same time in both seasons. Nevertheless; time elapsed between B.B. to F.B. was longer by 13 days in the second than in the first season, as blooming occurred earlier in the latter season. This leads to conclude that G.D.D. is not the only factor influencing the date of blooming. Bud burst occurred earlier in the second than in the first season thus a longer period elapsed between B.B. and F.B. in the latter season resulting in more accumulated G.D.D. in that period (about 25% more). Winter treatment of buds resulted in significant results. Hydrogen cyanamide resulted in earliness of blooming by 3 and 15 days than control in the two seasons, respectively. However; accumulated G.D.D. was nearly the same between B.B. and F.B. in the treated trees. Ammonium nitrate + oil resulted in earliness of 10 and 15 days, while, urea + oil advanced F.B. by 9 and 14 days and reduced needed G.D.D. apparently than the control. It seems that the effect of different winter sprayed compounds on buds comprises the reduction of the needed G.D.D.

Percentage of Fruit Set

Percentage of fruit set was not significantly affected by different treatments in the first season (Table 4). However, in the second season, mineral oil spray gave significantly higher fruit set percentage compared to the control. All other treatments reduced this percentage significantly compared to control except ammonium sulphate + oil, which did not affect it significantly.

It has been reported that H_2CN_2 in general did not affect Anna apple fruit set (Stino, 1997). However, urea + mineral oil treatment decreased fruit set (Mohamed *et al.*, 1995). It is worth mentioning that the drop of temperature from 19 to 12 ^{O}C during blooming lengthened the effective pollination period (E.P.P.) which affects pollination and fruit set (Tromp and Barsloon , 1994). In addition, the increase in temperature delayed fruit setting while favoured vegetative growth (Erez *et al.*, 2000).

Effect of.Different Treatments on Fruit Quality

When control fruits reached maturity after 130 and 132 days from F.B. in the two seasons, respectively, representing samples of ten fruits from specified replications were picked and the following characters were determined (Table 5).

Fruit weight

Control fruits weights were 145.5 and 118.2 (gm) in the two seasons, respectively. In the first season, H_2CN_2 resulted in the heaviest fruits (228.7gm) followed by the ammonium nitrate + oil treatment (206.8 gm) and both were significantly higher than control but insignificantly different from each other. The other tested treatments indicated insignificant differences between each other and the control. However, the same trend was observed, in the second season except for oil treatment which significantly increased fruit weight over the control.

Fruit volume

The treatments that increased fruit volume over the control (142.2 cm^3) in the first season were: ammonium nitrate + oil (204.4 cm^3), urea + oil (206.7 cm^3), Agrowmore + oil (193.3 cm^3) and hydrogen cyanamide (218.9cm^3). However, the treatments that produced fruits larger than the control (12.1 cm^3) in the second season were: ammonium nitrate + oil (218.9 cm^3), oil (174.4 cm^3) and hydrogen cyanamide (173.3 cm3). All other treatments indicated fruit volume statistically similar to the control.

Flesh firmness

Control (water treated) fruits were picked at flesh firmness of 2.9 and 3.5 (Kg/cm^2) in the two seasons, respectively. No significant changes in the flesh firmness were attributed to the conducted treatments in the first season. However, it was significantly decreased by ammonium nitrate + oil (2.5 Kg/cm^2), H_2CN_2 (2.6 Kg/cm^2) and Agrowmore + oil (2.9 Kg/cm^2) compared with the control. Nevertheless, it was insignificantly changed by the remaining treatments.

Juice T.S.S

Juice T.S.S. of control fruits when picked was 10.87 and 10.0 % in the two considered seasons, respectively. It was increased significantly as a result of the urea + oil treatment (12 %) in the first and the ammonium nitrate + oil in the second season (11.33 %). The remaining treatments resulted in insignificant changes compared to the control.

Juice acidity

Juice acidity amounted to 0.024 and 0.033 % when, control fruits were picked in the two season, respectively. The treatments that increased juice acidity significantly over the control in the two seasons were: ammonium sulphate + oil (0.027 and 0.037 % in the two seasons), urea + oil (0.027 and 0.036 %), Agrowmore + oil (0.026 and 0.036 %) and hydrogen cyanamide (0.027 and 0.035 %). The other tested treatments failed to give a consistent trend through the two seasons.

Results of fruit quality go in line with G.D.D. data (Table 3). As such, control fruits received nearly the same G.D.D. from F.B. till maturity, which was 2199 and 2257 units in the two years of the investigation, respectively. Fruits of all treatments received higher G.D.D. than the control fruits when picked on the same date. This was mainly because longer time elapsed between full blooming and picking at the maturity time of control fruits.

Warrington *et al*. (1999) reported that fruit expansion rate early in the season was highly responsive to heat. Temperature patterns in the two seasons of the investigation were nearly the same, however, fruits of the control were bigger in the first season than in the second one. Differences in weight and size is not attributed to high temperature, but to other factors such as the crop load. Hydrogen cyanamide and ammonium nitrate + oil resulted in the heaviest fruits in the two seasons. This might be due to the longer period of fruit development than the control. It has been reported that the H_2CN_2 treatments had no clear effect on the fruit weight of Anna apples (Stino, 1997). Flesh firmness was decreased by certain treatment namely H_2CN_2 and ammonium nitrate + oil treatments as fruits were picked in an advanced stage of development compared with the control. However, the decrease in flesh firmness was not so high to influence quality. Increased T.S.S. in juice of urea + oil treatment in the first season and ammonium nitrate + oil in the second season improved fruit quality. It seams that the acidity did not follow a constant pattern in the two seasons of the considered investigation.

It can be concluded that various treatments accelarated the incidence of blooming mainly by H_2CN_2 , ammonium nitrate + oil and urea + oil treatments. Full blooming was reached earlier in the treated trees. The earliest was induced by H_2CN_2, ammonium nitrate + oil and urea + oil. G.D.D. was not the only factor in reaching the full bloom, although the control trees received 26.5% more G.D.D. units in the blooming period of the second season than the first season. They reached the stage of full blooming at nearly the same day. However, the period between B.B. and F.B. was longer in the second than in the first season among all treatments. The effective winter sprayed chemicals reduced the needed G.D.D., which was more apparent in the second season. Fruit set was not affected by various treatments in the first season, but in the second season significant increase was obtained with oil treatment compared to the control. Maturity of control fruits was attained around 85 days of F.B.,although accumulated heat was higher during the first period than the second period of growth. Control fruits were smaller and lighter in the second season. This leads to a conclusion that heat accumulation is not the only important factor influencing fruit growth. Fruit weight, size and juice T.S.S. were increased by the effective treatments. However, firmness was slightly affected and acidity was mostly unchanged.

REFERENCES

A.O.A.C., (1980): Official methods of analysis of the association of agricultural chemists. 13 th ed.

Call, R.E. and S.D. Seeley (1989): Flower bud coatings of spray oils delay dehardening and bloom in peach trees. HortScience 24: 414-415

Edwards, G.R. (1985): Changes in endogenous hormones in apple during bud burst induced by defoliation. Acta Hort. 158: 203-210.

Erez,A.; Z. Yablowitz; R. Korcinski; M. Zilberstaine; N.J. Fokkema (Ed.); M.A. Beek; N.V. Steekelenburg (Ed.); G. Samyn (Ed.); J.L. Maas; T.L. Robinson (Ed.) and M.N.J. Verhoyen (2000): Greenhouse-growing of stone fruits: effect of temperature on competion sinks. Acta Hort. 513: 417-425.

Gianfagna, T.J. and S.A Mehlenbucher (1985): Importance of heat requirements for bud break and time of flowering in apple. HortScience 20: 909-911.

Hasseeb,G.M. and A.A. Elezaby (1995): Timing of hydrogen cyanamide application and full-bloom, fruit maturity and yield of two apple cultivars. Acta. Hort. 409: 185-190.

Jackon, J.E. and M.Bepete (1995): The effect of hydrogen cyanamide (Dormex) on flowering and cropping of different apple cultivars under tropical conditions of sub-optimal winter chilling. Scientia Hort. 60: 293-304.

Kilany, A.E. (1982): Effect of some growth regulators and horticultural practices on the growth, productivity and keeping quality of LeConte pear. Ph.D. Thesis, Fac. Agric., Cairo Univ.

Klinac, D.J.; H. Rohitha; and J.C. Pevreal (1991): Use of hydrogen cyanamide to improve flowering and fruit set in Nashi

Pyrus serotina Rehd. New Zealand J. of Crop and Hort. Sci. 19: 87-94.

Landsberg, J.J. (1979): From bud to bursting blossom: weather and apple crop. Weather, 34 (10): 394-407.

Mann, S.S.; H.Singh; A.S.Sanda; and G.P.S.Grewly (1994): Effect of hydrogen cyanamide on bud burst, flowering and fruit maturity of Baggugosha pear. Acta Hort. 367:214-223

Mohamed, S.M.; W.A.Abdel-Wahab; M.A. Fayek; and T.A. Fayed. (1995): Effect of some chemical treatments on flowering and fruiting of different shoot types of Anna apple trees. Bull.Fac.Agric.,Cairo.Univ. 46:229-242.

Moktar, H.; E.M. El Fakharani; and R.G. Stino (1994): Effect of hydrogen cyanamide on flowering, yield and fruit quality of some Asian pear cultivars grown in Egypt. J.Appl.Sci. 9 (3):140-159.

Munoz, C.; G. Sepulveda; and J. Garcia-Huidobra (1986): Determining thermal time and base temperature required for fruit development in low-chilling peaches. HortScience 21:520-522.

Pasqual, M. and J.L. Petri (1978): Nerol oil as an apple dormancy-breaking agent. Pesquisa-Agropecuaria-Brasileira 13 (4): 27-34.

Perry, K.B.; T.C. Whner; and G.L. Jphnson (1986): Comparison of 14 methods to determine heat unit requirements for cucumber harvest. HortScience 21: 419-423.

Petri, J.L. and H. Stuker (1995): Effect of mineral oil and hydrogen cyanamide concentrations on apple dormancy, C.V. Gala. Acta Hort.395: 161-168

Sisler, G.P. and E.L.Overholser (1943): Influence of climatic conditions on date of full bloom of Delicious apple in Wentachee Valley. Proc.Amer.Soc.Hort.Sci. 43: 29-43.

Spiegel-Ray and F.H. Alston (1979): Chilling and post-dormant heat reqirement as selection criteria for late-flowering pears. J. Hort. Sci. 59:115-120.

Snedecor, G.W. and W.G. Cochran (1980). Statistical Methods. Oxford and J.B.H.Bub Com. 6 th edition

Stino, G.R. (1957): Studies on the changes in the skin and flesh texture constituents of LeConte pear fruit during growth, storage and ripening. Ph.D. Thesis, Fac. Agric. Cairo Univ.

Stino, R.G.(1987): Effect of some chemicals on defoliation and floral bud activity of LeConte pear trees. M.Sc. Thesis, Fac. Agric., Cairo Univ.

Stino, R.G. (1997): Response of Anna apple trees to some treatments with hydrogen cyanamide, mineral oil and their combinations during the dormant season.Egypt.J.Hort.24 (1):43-57.

Stino, R.G. and M. H.Rashad, (2002). Effect of some nitrogenous compounds, mineral oil, chilling and G.D.D. on LeConte pear bud activity in north Egypt. (In press).

Tourky, M.A.; S.S.El-Shahat and M.H.Rizk, (1995): Effect of Dormex on fruit set and storage life of Thompson Seedless (Banati) grapevines. J.Agric.Sci.Mansoura Univ. 20: 5139-5151.

Tromp, P.J. and Barsloon, (1994): The effect of autumn and spring temperature on fruit set and on the effective pollination period in apple and pear. Scientia Hort. 60: 23-30.

Wali, Y.A. (1958): Studies on the artificial ripening of pear fruits. Ph.D. Thesis, Fac. Agric., Cairo Univ.

Warrington, I.J.; T.A. Fulton; I.A.Halligan; and H.Silva, (1999): Apple fruit growth and maturity are affected by early season temperature. J. Amer.Soc.Hort.Sci. 124: 468-477.

Zilkah, S.; S.Z.Shamian; I. David; Y. Yeselson; G. Faingersh; A. Rotbaum; O. Ribak; and H. Hupert. (2000). Influence of foliar application of nitrogen on pome fruit productivity .I.S.H.S. 8th International Pear Symposium Abstr. pp: 215.

Table 1: Percentages of buds reaching the stage of full bloom at specified dates as affected by the tested nitrogen compounds in 1998 & 1999 seasons.

Treatment	Season	1998			1999			
	Date	13/3	20/3	27/3	5/3	12/3	19/3	26/3
Ammonium sulphate	%	0.01	10.07	100	0.01	0.01	0.01	100
	Angle	0.01C	18.12D	90.05A	0.01B	0.01D	0.01D	90.05A
Ammonium sulphate + Oil	%	0.01	2.00	100	0.01	12.44	100	100
	Angle	0.01C	6.58D	90.05A	0.01B	15.82B	90.05	90.05A
Ammonium nitrate	%	0.01	15.83	100	3.37	100	100	100
	Angle	0.01C	23.42CD	90.05A	8.58B	90.05A	90.05A	90.05A
Ammonium nitrate + Oil	%	12.14	98.70	100	24.10	100	100	100
	Angle	16.05B	86.25A	90.05A	27.17A	90.05A	90.05A	90.05A
Urea	%	0.01	58.03	100	0.01	0.01	0.01	100
	Angle	0.01C	52.74B	90.05A	0.01B	0.01D	0.01D	90.05A
Urea + Oil	%	0.01	86.70	100	0.01	100	100	100
	Angle	0.01C	72.35AB	90.05A	0.01B	90.05A	90.05A	90.05A

Table 1: (Cont.)

Agrowmore	%	0.01	56.23	100	0.01	5.4	5.4	100
	Angle	0.01C	48.66BC	90.05A	0.01B	13.05BC	13.05B	90.05A
Agrowmore + Oil	%	0.01	79.73	100	0.01	1.87	1.873	100
	Angle	0.01C	63.48AB	90.5A	0.01B	4.57CD	4.57C	90.05A
Oil	%	0.01	0.80	100	0.01	0.01	100	100
	Angle	0.01C	2.97D	90.05A	0.01D	0.01B	90.05A	90.05A
Hydrogen cyanamide	%	29.43	100	100	3.27	100	100	100
	Angle	30.68A	90.05A	90.05A	6.09B	90.05A	90.05A	90.05A
Control (H_2O)	%	0.01	0.01	100	0.01	0.01	0.01	100
	Angle	0.01C	0.01D	90.05A	0.01B	0.01D	0.01D	90.05A

Mean separation between angles within columns by Duncan's multiple range test at 5 % level.
Means followed by the same letters are not significantly different at 5 % level

Table 2: Effect of tested treatments on the day of the year (D.Y.) on which bud burst (B.B.), full blooming (F.B.), period from B.B. to F.B., earliness from control and days from treatment to F.B. in both 1998 & 1999 seasons.

Treatments	1998 season					1999 season				
	D.Y B.B.	D.Y. F.B.	B.B. to F.B. (days)	Earliness from control (days)	Days from treatment to F.B.	D.Y B.B.	D.Y. F.B.	B.B. to F.B. (days)	Earliness from control (days)	Days from treatment to F.B.
Ammonium sulphate	47A	84B	37	1	63	33B	83A	50	0	62
Ammonium Sulphate + Oil	48B	84B	36	1	63	30E	75B	45	8	54
Ammonium nitrate	46D	83C	37	2	62	32C	68C	36	15	47
Ammonium nitrate + Oil	39H	75H	36	10	54	31D	68C	37	15	47
Urea	42F	82D	40	3	61	33B	83A	50	0	62
Urea + Oil	41G	76G	35	9	55	33B	69C	36	14	48
Agrowmore	43E	80E	37	5	59	32C	82A	50	1	.61
Agrowmore + Oil	41G	77F	36	8	56	33B	83A	50	0	62
Oil	49A	84B	35	1	63	33B	76B	43	7	55
Hydrogen cyanamide	38I	72I	34	13	51	33B	68C	35	15	47
Control (H_2O)	49A	85A	36	------	64	34A	83A	49	------	62

Mean separation between angles within columns by Duncan's multiple range test at 5 % level.
Means followed by the same letters are not significantly different at 5 % level

Table 3: Effect of tested treatments on the accumulated G. D. D. from 50 % bud burst (B.B.) to full bloom (F.B.) and from F.B. to picking date (P.D.) in 1998 & 1999 seasons.

Treatments	1998 season		1999 season	
	B.B. to F.B. (days)	F.B. to P.D. (days)	B.B. to F.B. (days)	F.B. to P.D. (days)
Ammonium sulphate	321	2206.8	480	2257.1
Ammonium sulphate + Oil	311	2206.8	428	2338.3
Ammonium nitrate	324	2214.8	335	2411.8
Ammonium nitrate + Oil	329	2271.9	350	2411.8
Urea	356	2223.4	480	2257.1
Urea + Oil	314	2262.6	336	2400.4
Agrowmore	331	2238	479	2266.8
Agrowmore + Oil	328	2256.5	480	2257.1
Oil	301	2206.8	407	2328
H_2CN_2	307	2301.5	326	2411.8
Control (H_2O)	345	2199.4	470	2257.1

Table 4: Effect of different treatments on the percentage of initial fruit set in both 1998 & 1999 seasons.

Treatments	1998 season	1999 season
Ammonium sulphate	5.8A	15.33CDE
Ammonium sulphate + Oil	0.70A	17.90BC
Ammonium nitrate	2.234A	10.83DEF
Ammonium nitrate + Oil	1.467A	8.733F
Urea	2.70A	16.03CDE
Urea + Oil	0.90A	10.50EF
Agrowmore	1.2A	16.47CD
Agrowmore + Oil	1.567A	15.27CDE
Oil	1.433A	29.10A
H_2CN_2	1.133A	11.43DEF
Control (H_2O)	5.50A	23.07B

Mean separation between angles within columns by Duncan's multiple range test at 5 %.
Means followed by the same letters are not significantly different at 5 % level

Table 5: Effect of tested treatments on the major fruit charcteristics in 1998 and 1999 seasons.

Treatments	1998 season					1999 season				
	Averag e weight (gm)	Average volume (cm^3)	Firmness (Kg/cm^2)	T.S.S. (%)	Acidity (%)	Average weight (gm).	Average volume (cm^3)	Firmness (Kg/cm^2)	T.S.S. (%)	Acidity (%)
Ammonium sulphate	177.8 ABCD	160 BCD	2.6 B	11.13 BC	0.0209 9 DE	137.2 BCD	139.4 BCD	3.133 BCD	10.5 AB	0.036 8 C
Ammonium sulphate+Oil	186.8 ABCD	181.1 ABCD	2.767 AB	10.80 C	0.0276 9 AB	135.6 BCD	136.7 BCD	3.300 ABC	10.0 B	0.037 7C
Ammonium nitrate	182.6 ABCD	180 ABCD	2.467 B	10.93 BC	0.0223 3 D	134.8 BCD	136.1 BCD	3.067 BCD	10.17 AB	0.039 5 B
Ammonium nitrate + Oil	206.8 AB	204.4 AB	2.5 B	11.33 ABC	0.0205 5 E	216.2 A	218.9 A	2.5 E	11.33 A	0.047 1A
Urea	138.2 D	135.6 D	3.167 A	11.0 BC	0.0250 1 C	113.1 D	116.1 D	3.067 BCD	9.5 B	0.037 2 C
Urea + Oil	201.0 ABC	206.7 AB	2.633 B	12.0 A	0.0276 9 AB	159.6 BC	162.2 BC	3.5 AB	9.67 B	0.036 8 C
Agrowmore	192.2 ABCD	188.9 ABC	2.933 AB	11.40 ABC	0.0290 3 A	117.8 CD	116.1 D	3.2 BC	9.5 B	0.033 5 D
Agrowmore + Oil	198.7 ABC	193.3 AB	2.867 AB	11.53 ABC	0.0268 0 B	149.6 BCD	151.1 BCD	2.867 CDE	10.33 AB	0.036 8 C
Oil	170.2 BCD	167.8 ABCD	3.133 A	11.47 ABC	0.0205 5 E	169.9 B	174.4 B	3.8 A	10.17 AB	0.037 7 C
Hydrogen cyanamide	228.7 A	218.9 A	2.567 B	11.67 AB	0.0276 9 AB	170.5 B	173.3 B	2.633 DE	10.5 AB	0.035 3 C
Control (H_2O)	145.5 CD	142.2 CD	2.90 AB	10.87 BC	0.0241 2 C	118.2 CD	121.1 CD	3.5 AB	10.0 B	0.033 5 D

Mean separation between angles within columns by Duncan's multiple range test at 5 % level.
Means followed by the same letters are not significantly different at 5 % level

الأثر المقارن لرشات موسم السكون على أشجار الكمثرى الليكونت من حيث التزهير، العقد وصفات الثمار وعلاقته بالحرارة.

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أجريت الدراسة في عامي ١٩٩٨ و ١٩٩٩ حيث تم رش سيناميد الهيدروجين (يدءك ن٢) أو نترات الأمونيوم + الزيت الشتوى أواليوريا + الزيت الشتوي في ٢١ يناير. و كان للمعاملات أثر واضح على تبكير اكتمال التزهير لأشجار الكمثرى الليكونت. و كانت تواريخ التزهير متماثلة تقريبًا فى الموسمين فى أشجار المقارنة بالرغم من أن تفتح البراعم كان أكثر تبكيرا كما أن درجات النمو اليومية كانت أعلى في الموسم الثاني (٣٤٥، ٤٧٠ للموسمين على التوالى). و قد أدت المعاملات المؤثرة إلى تقليل درجات النمو اليومية المطلوبة للتزهير وكان هذا أكثر وضوحًا في الموسم الثاني. و بصفة عامة لم يكن لكل المعاملات أثر واضح على نسبة العقد في الموسمين. وقد لوحظ أن لكتمال نمو ثمار المقارنة كان بعد ١٣٠ و ١٣٢ يوماً من اكتمال التزهير بعد التعرض إلى ٢١٩٩ و ٢٢٥٧ درجة نمو يومية للموسمين على التوالي. وقد تم جمع الثمار في جميع المعاملات عند وصول ثمار المقارنة إلي اكتمال النمو. و قد تبين أن ثمار المعاملات المختلفة كانت أكبر و أثقل و أعلى في المواد الصلبة الذائبة الكلية وأقل في الصلابة عن ثمار المقارنة في حين الاختلاف في الحموضة لم يكن له اتجاه ثابت. و قد أظهرت نتائج هذه الدراسة أن درجات النمو اليومية ليست هي العامل الرئيسي المؤثر في التزهير.