Effect of Some Dormancy Breaking Treatments on Yield and Fruit Quality of "Le Conte" Pear Trees

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Abstract:present work was carried out during two successive seasons of 2015 and 2016. Experimental treatments were applied on 5 years old, 'Le Conte' pear trees budded on ***Pyrusbetulaefolia*** rootstock, planted at distance of 3 × 5 meters and grown in sandy soil under drip irrigation system in a private orchard located at Al- Hussein association for reclaiming and cultivating land, Kilo 64 Cairo Alexandria desert road, Giza governorate, Egypt. The field experiments was designed to evaluate the efficacy of using some dormancy breaking materials (Milagro, Dormex, Mineral oil and Thiourea) on yield and fruit quality. The obtained results showed that dormancy braking treatmentsat various dates had simultaneously effecton some fruit physical characteristics of 'Le Conte' pear cultivartrees such as an early beginning of flowering, fruit weight, volume, length, diameter and firmness as well as yield (kg)/ tree of 'Le Conte' pear cultivar fruits. These parameters were positively affected by all treatments in comparison to that of the control trees. Pear trees sprayed with Thiourea and mineral oil at 6 % gave higher significant values of fruit T.S.S (%)than those sprayed with Dormex or Milagro. Generally, spraying Le-Conte pear trees by breaking dormancy substances (Feb. 5th) obtained the highest yield and the best fruit quality suitable for export and domestic consumption. In addition, regularity the bud burstand balances between flowering and vegetative buds.

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1. Introduction

Pear is one of the favorite fruits in the temperate climate zone. It is considered as the third deciduous fruits in the worldwide and it is also the fourth fruit among all fruit crops in distribution through the global market **FAO (2016).** 'Le Conte' pear resulted as a hybrid between ***Pyruscommunis*×*Pyrusserotina***and it is the mainpear cultivar grown in Egypt. However, the total cultivated area of pears fluctuated sharply during the lastdecades due to fire blight infection. In 2016, the harvested area reached approximately 9875 feddan, while the production was about 60054 tons **FAO (2016).**

Pear trees production under warm climates faced the problem of inadequate winter needed hours. Under such conditions the pear trees might be suffered from delayed leafing that may occur **Saure (1985)**, subsequently the number of fruit set showed to be directly decreased. Many chemical agents have been proved to induce the physiological dormancy breaking activity, such as mineral oil, GA_3, potassium nitrate (KNO_3), Thiourea, hydrogen cyanamide (H_2CN_2), fatty acids and Milagro**Erez (2000)**. The use of mineral oil, needed to standardize and anticipate budding in the peach and nectarine when grown in subtropical regions, had no effect on the quality attributes of the fruit, with the exception of pH, in which the fruit under application of these products presented higher values for the two evaluation cycles **Leonel *et al.* (2014)**. For Dormex (hydrogen cyanamide) a dormancy breaking agent was used widely to break bud dormancy **Sagredo*et al.*(2005).**

As for Milagro, it contains (20% Phosphorus, 10% potassium, 3% Boron and 0.2% Brassinolide) which considered a plant hormone from Brassica pollen grains **Grove *et al.* (1979)**. Brassinosteroids have been shown to be involved in numerous plant processes such as promotion of cell BR expansion and cell elongation, **Clouse and Sasse (1998)**. Brassinosteroids are essential for many physiological functions in plants, it regulates dormancy induction and cell cycle progression **Montoya *et al.* (2005)**. Thiourea is an organ sulfur compound with the formula SC $(NH_2)_2$. It is structurally similar to urea, except that the oxygen atom is replaced by a sulfur atom, but the properties of urea and thiourea differ significantly. Thiourea is a reagent in organic synthesis. **Bernd *et al.* (2002).**This compound enhances the contents especially, biogenic amines and proline, starting the bud break and increasing fruit set% and yield of pear tress. **Walton *et al.* (1991)**. Therefore, the present work was carried out to study the effects of some dormant breaking treatmentsat different investigated dates on yield and fruit quality of 'Le Conte' pear trees.

2. Materials and Methods

The present work was carried out during two successive seasons of 2015 and 2016. Experimental treatments were applied on 5 years old, 'Le Conte' pear trees budded on ***Pyrusbetulaefolia*** rootstock, planted at distance of 3 × 5 meters and grown in sandy soil under drip irrigation system in a private Orchard located at Al- Hussein association for reclaiming and cultivating land, Kilo 64 Cairo Alexandria desert road, Giza governorate, Egypt. The tested trees were approximately uniform in vigor and healthy in appearance.The experimental trees were received the normal agricultural practices ordinary adapted in the commercial orchards with respect to, organic and mineral fertilizers along with irrigation and pest control recommended in this area according to the recommendations of Ministry of Agriculture in Egypt. This experiment concerned with spraying pear trees with four bud-breaking agents i.e., Hydrogen Cyanamide (Dormex), Brassinolide (Milagro), Mineral oil (Kabel 2) and Thiourea at different concentrations. The experiment was made on (207) fruited trees arranged in twelve treatments in three replicates represented by Three trees for each replicate. The selected trees were subjected to twelve foliar sprays with tested substances at different concentrations along with water as a control treatment. All treatments applied in winter on dormant trees at two different assigned times i.e.,the first date was at 5th February (20 days before bud swelling stage) and the second time was at 20th February (10 days before bud swelling stage) throughout the two successive seasons of2015 and 2016.

2.1. The applied treatments were arranged as follows:

1- Control: the trees were sprayed with water.

2- Hydrogen Cyanamide (Dormex at concentration 2 %).

3- Hydrogen Cyanamide (Dormex at concentration 3 %).

4- Hydrogen Cyanamide (Dormex at concentration 4 %).

5- Brassinolide (Milagro concentration 4 %).

6- Brassinolide (Milagro at concentration 5 %).

7- Brassinolide (Milagro at concentration 6 %).

8- Mineral oil (Kabel 2) at concentration 2 %.

9- Mineral oil (Kabel 2) at concentration 4 %.

10-Mineral oil (Kabel 2) at concentration 6 %.

11- Thiourea at concentration 1 %.

12- Thiourea at concentration 5 %.

Aqueous Solutions of studied substances were prepared in the laboratory and diluted to tested concentrations by tap water just before application in the farm. Triton B emulsifier at a rate of 0.2 % was used as a wetting agent during application.Spraying was done until run off point using a hand pressure sprayer. All bud breaking materials (Dormex is a commercial name of hydrogen cyanamide (H_2CN_2), Milagro is a commercial name of Brassinolide (BL) registered by NO. 7239 in Ministry of Agriculture, Mineral oil and Thiourea) were obtained from private agricultural companies, Egypt.

2.2. Yield / tree (Kg):

At fruit maturity (130-135 days after petal fall, 12 % TSS and 13 – 15lb /inch^2 firmness) according to **Kilany (1982)** and **Nasr (2002)** the fruits were harvesting. At the beginning of August during the two successive seasons of 2015 and 2016.10 fruits from each tree were counted and weighted and the average fruit weight was calculated. Then total yield was determined as (Kg/tree) by multiplication number of fruits per tree with an average fruit weight.

2.3. Fruit quality parameters:

Sample of 10 fruits for each tree were devoted to determine both physical and chemical characteristics of fruit.

2.3.1. Fruit physical characteristics:

2.3.1.1. Average fruit weight (g):

Fruit samples were weighted on a digital electric balance with 5gm sensitivity.

2.3.1.2. Average fruit volume (ml^3):

The average fruit volume was found by immersing representative 10 fruits in water container individually, from which the average volume of the fruit was determined by water displacement using a graduate jarand the average of fruit volume was recorded.

2.3.1.3. Average fruit dimensions (cm):

Both length and diameter of 10 fruits from each tree were carried out using verniercaplier and the average of fruit length and diameter were recorded.

2.3.1.3. Fruit firmness (kg/cm^2):

Fruit firmness was measured using pressure tester using 5/16 plunger (digital force-Gouge ModelIGV-O.SA to FGV-100A.Shimpo instruments) on the same fruits.

2.4. Fruit chemical analysis:

Samples of fruit juice filtered through muslin cloth were used to determine the following chemical characteristics:

2.4.1. Total soluble solids percentage (TSS %):

Total soluble solids of fruit juice was estimated by a'bbe digital refractometer according to **A.O.A.C. (2000).**

2.4.2. Total acidity percentage:

It was determined by titrating 10 ml juice from each sample against Na OH (0.1N) using phenolphthalein (ph.ph) as indicator. The acidity was determined as citric acid according to **A.O.A.C. (2000)**.

2.4.3. Total soluble solids/acid ratio:

It was determined as the following equation Total soluble solids/Acid ratio = TSS / Total acidity.

2.4.4. Total sugars %:

Total sugars ware determined by using the methods of **AOAC (2000)** and the concentration were calculated as gm. glucose per 100 g dry flesh weight.

Statistical analysis:

The differences between the tested treatments were statistically analyzed in factorial completely randomized blocks design and the means were compared using the Least Significant Difference test (L.S.D) at 5% level according to **Snedecor and Cochran (1980)**.

3. Results

3.1. Effect of some dormancy breaking treatments on yield (kg)/tree:

Data in table (1) showed that dormancy breaking application significantly increased number of fruits / tree and yield (kg)/tree when compared with untreated trees (control) of the studied pear cultivar and in the two studied seasons. In addition, the obtained results clearly indicated that, Milagro treatments gave the highest yield (kg)/tree parameter followed by mineral oil and Dormex treatments in descending order regardless the concentrations in both seasons. These results are in line with those obtained by **Kabsha (2017)** who found that spraying dormancy breaking agents such as (Milagro, mineral oil and Dormex) at different concentrations significantly increased fruit yield (kg)/tree of Florida prince trees than the control. Concerning the effect of Dormex, Milagro and mineral oil on fruit yield (kg)/treeof 'Le Conte' pear cultivar, the tabulated data proved the superiority of Milagro treatments. The results showed significant differences for fruit yield (kg)/tree among tested concentrations of Milagro especially for two studied seasons. Whereas, other treatments recorded intermediate values of fruit yield (kg)/treebetween mineral oil, Dormex and Thiourea treatments during both seasons of study. On the other hand, the control treatment was the lowest number of fruits / tree and yield (kg)/tree. In addition, all dormancy breaking treatments on 5th Feb. significantly induced a higher fruit yield (kg)/treethan spraying on 20th Feb. treatments for the two studied seasons.

The increment in yield expressed as kilogram per tree for all treatments may be due to their effect on increasing both number of fruits/tree and average fruit weight. These results are in the same line with **Wang *et al.* (2003)** who reported that brassinolide increased fruit weight of orange. In addition, **Gomes *et al.* (2006)** on passion fruit trees sprayed with brassinolide, the fruits number per plant and in turn yield per hectare were increased. **Ibn-Maaouia *et al.* (2012)** on pepper found that, plants sprayed with 24-epibrassinolide recorded improving of fruits number and yield per plant. On the other hand, **Shaltout *et al.* (1993)** who worked on apricot and plum. They mentioned that hydrogen cyanamide increased fruit set. These results may be attributed to the enhancement effect of HCN spray as a result to early breaking vegetative buds before floral buds.

We can come to the conclusion that some dormancy braking treatmentsat various dates had simultaneously affected on number of fruits / tree and yield (kg)/tree when compared with untreated trees (control) of the studied pear cultivar and in the two studied seasons. Milagro treatments gave the highest yield (kg)/tree parameter followed by mineral oil and Dormex treatments in descending order regardless the concentrations in both seasons.

3.2. Effect of some dormancy breaking treatments on some fruit physical characteristics:

The obtained data in the Tables (2 and 3) showed the effect of Dormex, Milagro, mineral oils and Thiourea on fruit weight, volume, length, diameter and firmness of 'Le Conte' pear cultivar fruits. These parameters were positively affected by all treatments in comparison to that of the control trees. In addition, pear trees sprayed with Thiourea at concentration 5% gave higher significant values of fruit weight, volume, diameter andfirmness than those sprayed with Dormex, mineral oil or Milagro regardless the effect of concentrations within each breaking material alone.

The obtained results in the same tables also revealed that spraying trees with Milagro produced a higher fruit length than those sprayed dormancy breakingor the untreated trees. Generally, all studied fruit physical characteristics i.e. fruit volume, length, diameter and firmness take the same trend as affected by different treatments in both seasons of study.

In this respect, **El-Sabagh *et al.* (2012)** found that Dormex treatments increased significantly the fruit weight, size, length and diameter of Anna apple fruits. The highest significant values of fruit physical parameters were obtained from Anna apple trees treated with 2 and 3% Dormex.Also,**Mohamed and Sherif (2015)**cleared that all fruit physical parameters were positively affected by spraying both chemicals (Milagrow and Dormex) treatments than control. Similarly,**Fahmy *et al.* (2015) and Kabsha (2017)** who workedon Florida Prince peach trees reported that foliar application of Milagrow at 0.04, 0.05 and 0.06 % before bud burst by 7 to 10 days were the best treatments for improving fruit quality comparing with other dormancy breaking agents treatments or control.

Table (1): Effect of some dormancy breaking treatments on different dates on number of fruits per tree and yield per tree of 'Le Conte' pear cultivar during 2015 and 2016 seasons.

Character.	Number of fruits / tree			Yield (kg) /tree		
Date of spraying / Treatment	Feb. 5th	Feb. 20th	Average (B)	Feb. 5th	Feb. 20th	Average (B)
Season 2015						
Control	41	31	36 H	6.05	5.25	5.65 J
Dormex at 2 %	68	44	56 G	12.94	8.65	10.79 I
Dormex at 3 %	109	72	91 E	23.28	17.65	20.47 G
Dormex at4 %	203	91	147 C	44.14	22.52	33.33 D
Milagro at 4 %	89	68	79 F	15.82	11.58	13.70 H
Milagro at 5 %	146	77	112 D	29.33	15.33	22.33 F
Milagro at 6 %	232	132	182 A	59.43	32.93	46.18 A
Mineral oil at 2 %	73	47	60 G	13.07	8.58	10.38 I
Mineral oil at 4 %	151	83	117 D	31.80	18.77	25.29 E
Mineral oil at 6 %	224	105	165 B	47.46	25.03	36.25 C
Thiourea at 1 %	120	76	98 E	23.66	15.77	19.72 G
Thiourea at 5 %	201	90	146 C	54.70	22.63	38.67 B
Average (A)	138 a	76 b		29.53 a	16.96 b	
LSD at 5% for:Date (A):	3.23			0.71		
Treatment (B):	8.13			1.74		
Interactions (A× B)	11.49			2.45		
Season 2016						
Control	34	88	61 I	4.37	15.11	9.74 I
Dormex at 2 %	243	165	204 H	40.88	32.48	36.68 H
Dormex at 3 %	295	212	254 F	58.49	49.18	53.84 F
Dormex at4 %	326	500	413 C	67.68	118.37	93.02 C
Milagro at 4 %	264	210	237 G	44.84	36.62	40.73 G
Milagro at 5 %	270	371	221 E	58.35	64.94	61.65 E
Milagro at 6 %	600	547	574 A	145.13	117.89	131.51 A
Mineral oil at 2 %	321	138	230 G	58.44	23.99	41.22 G
Mineral oil at 4 %	388	284	336 D	79.91	58.08	68.99 D
Mineral oil at 6 %	615	458	537 B	130.47	94.31	112.39 B
Thiourea at 1 %	212	300	256 F	37.09	6 5.19	51.14 F
Thiourea at 5 %	503	305	404 C	120.98	71.14	96.06 C
Average (A)	339 a	298 b		70.55 a	62.28 b	
LSD at 5% for:Date (A):	4.27			1.33		
Treatment (B):	10.45			3.27		
Interactions (A× B)	14.77			4.62		

Table (2): Effect of some dormancy braking treatments at different dates on some fruit physical properties of 'Le Conte' pear cultivar during 2015 season.

Character.	Fruit weight (g)			Fruit volume (cm^3)			Fruit length (cm)			Fruit diameter (cm)			Fruit firmness (kg/cm^2)		
Date of spraying / Treatment	Feb. 5th	Feb. 20th	Average (B)	Feb. 5th	Feb. 20th	Average(B)	Feb. 5th	Feb. 20th	Average (B)	Feb. 5th	Feb. 20th	Average (B)	Feb. 5th	Feb. 20th	Average (B)
Control	147.53	167.63	157.58 k	150.56	176.67	163.61 l	8.20	8.38	8.29 f	6.63	6.23	6.43 e	7.11	8.62	7.87 f
Dormex at 2 %	191.09	196.64	193.87 h	184.44	206.67	195.56 h	8.95	8.60	8.78 de	7.07	6.78	6.93 cd	7.83	9.22	8.52 e
Dormex at 3 %	213.58	244.20	228.89 d	218.89	236.67	227.78 d	9.85	9.42	9.63 a	7.33	7.02	7.18 bc	9.06	9.62	9.34 cd
Dormex at4 %	217.45	246.20	231.82 c	238.33	246.67	242.50 b	9.97	9.52	9.74 a	7.77	7.13	7.45 ab	9.40	10.02	9.71 bc
Milagro at 4 %	177.95	171.12	174.54 j	160.56	187.78	174.17 k	8.95	8.75	8.85 de	7.02	6.45	6.73 de	7.55	8.88	8.22 ef
Milagro at 5 %	200.66	198.37	199.52 g	212.22	221.11	216.67 f	9.30	8.75	9.03 bcd	6.78	6.85	6.82 cde	9.05	9.58	9.32 cd
Milagro at 6 %	256.58	249.66	253.12 b	219.89	242.22	231.06 c	9.90	9.47	9.68 a	7.80	7.13	7.47 ab	9.51	10.08	9.79 b
Mineral oil at 2 %	179.20	182.06	180.63 i	180.00	190.00	185.00 j	8.85	8.50	8.68 de	7.08	6.60	6.84 cd	7.26	8.80	8.03 f
Mineral oil at 4 %	210.14	226.47	218.30 f	205.00	217.78	211.39 g	9.50	8.95	9.23 bc	6.70	6.83	6.77 cde	8.76	9.42	9.09 d
Mineral oil at 6 %	211.63	237.98	224.80 e	216.67	226.67	221.67 e	9.58	9.03	9.31 b	7.20	6.97	7.08 bcd	9.10	9.71	9.42 bcd
Thiourea at 1 %	196.79	206.56	201.67 g	183.33	204.44	193.89 i	8.78	8.48	8.63 e	7.13	6.60	6.87 cd	9.17	9.88	9.53 bcd
Thiourea at 5 %	272.56	252.54	265.55 a	293.89	270.00	281.95 a	8.78	9.13	8.96 cde	7.90	7.27	7.58 a	9.60	11.18	10.39 a
Average (A)	206.26 b	214.95 a		205.31 b	218.89 a		9.22 a	8.92 b		7.20 a	6.82 b		8.62 b	9.58 a	
LSD at 5% for:Date(A):	0.92			0.66			0.13			0.15			0.16		
Treatment (B):	2.27			1.61			0.32			0.36			0.40		
Interactions (A× B)	3.20			2.28			0.45			0.51			0.57		

Table (3): Effect of some dormancy braking treatments at different dates on some fruit physical properties of 'Le Conte' pear cultivar during 2016 season.

Character.	Fruit weight (g)			Fruit volume (cm^3)			Fruit length (cm)			Fruit diameter (cm)			Fruit firmness (kg/cm^2)		
Date of spraying / Treatment	Feb. 5th	Feb. 20th	Average (B)	Feb. 5th	Feb. 20th	Average(B)	Feb. 5th	Feb. 20th	Average (B)	Feb. 5th	Feb. 20th	Average (B)	Feb. 5th	Feb. 20th	Average (B)
Control	128.94	171.72	150.33 i	180.55	136.67	158.61 h	8.36	8.05	8.21 e	6.56	6.20	6.38 f	6.51	6.32	6.41 e
Dormex at 2 %	168.26	196.93	182.60 g	214.44	198.89	206.67 f	9.10	8.19	8.64 cd	7.28	6.56	6.92 cde	6.68	6.81	6.74 de
Dormex at 3 %	198.30	232.06	215.16 d	226.67	217.78	222.22 d	9.19	9.10	9.15 ab	7.40	6.95	7.18 bcd	7.53	7.12	7.33 bc
Dormex at 4 %	207.61	236.66	222.14 c	257.78	220.00	238.89 b	9.42	9.35	9.39 a	7.46	6.99	7.23 bc	7.61	7.30	7.46 b
Milagro at 4 %	169.77	174.31	172.04 h	183.33	187.78	185.56 g	8.42	8.91	8.66 cd	6.69	6.76	6.73 e	6.74	6.72	6.73 de
Milagro at 5 %	216.01	175.01	195.51 f	212.22	221.11	216.67 e	8.53	8.91	8.72 cd	7.10	7.19	7.15 bcd	6.82	7.19	7.05 cd
Milagro at 6 %	241.90	215.53	228.71 b	223.33	236.55	229.94 c	9.73	9.06	9.37 a	7.34	7.23	7.29 b	7.35	7.60	7.48 b
Mineral oil at 2 %	182.08	174.03	178.05 g	180.55	192.78	186.67 g	8.36	8.63	8.50 de	6.85	6.87	6.86 de	6.89	6.32	6.60 de
Mineral oil at 4 %	205.94	204.49	205.22 e	204.44	211.67	208.06 f	8.70	8.88	8.79 bcd	7.12	6.91	7.02 bcde	7.11	6.69	6.90 d
Mineral oil at 6 %	212.14	205.89	209.01 e	222.22	218.89	220.56 de	8.86	9.06	8.94 bc	7.25	7.09	7.17 bcd	7.42	7.28	7.35 bc
Thiourea at 1 %	175.01	217.29	196.15 f	242.89	136.67	189.78 g	8.81	8.18	8.50 de	7.21	6.53	6.87 de	7.68	7.20	7.44 b
Thiourea at 5 %	240.50	233.23	236.86 a	246.67	250.55	248.61 a	9.32	8.76	9.04 abc	7.58	7.62	7.6 a	8.67	7.59	8.13 a
Average (A)	195.54 b	203.09 a		216.26 a	202.44 b		8.90 a	8.75 b		7.15 a	6.91 b		7.25 a	7.01 b	
LSD at 5% forDate (A):	2.04			1.68			0.15			0.12			0.16		
Treatment (B):	5.03			4.12			0.36			0.28			0.38		
Interactions (A× B)	7.07			5.83			0.51			0.41			0.54		

3.3. Effect of some dormancy breaking treatments on some fruit chemical characteristics:

The results in the Tables (4and 5) showed the effect of Dormex, Milagro, mineral oils and Thiourea onsome fruit chemical characteristicsof 'Le Conte' pear cultivar fruits. T.S.S (%) was positively affected by all treatments in comparison with control trees. In addition, pear trees sprayed with Thiourea at 5 % and mineral oil at 6 % gave ahigher significant values of fruit T.S.S (%)than those sprayed with Dormex or Milagro regardless the effect of concentrations within each breaking material alone. With regard to the effect of dormancy breaking agents on total acidity percentage, data from the same table showed that untreated trees gave a higher values of total acidity than those sprayed with Dormex, Milagro, mineral oils and Thiourea. Furthermore, trees sprayed with mineral oil at 6 % gave lower values of total acidity than others did in the two studied seasons.

Table (4): Effect of some dormancy braking treatments at different dates on some fruit chemical characteristics of 'Le Conte' pear cultivar during 2015 season.

Character.	T.S.S (%)			Total acidity(%)			TSS / Acid ratio			Total sugars (% of fruit dr.wt.)		
Date of spraying / Treatment	Feb. 5th	Feb. 20th	Average (B)	Feb. 5th	Feb. 20th	Average(B)	Feb. 5th	Feb. 20th	Average (B)	Feb. 5th	Feb. 20th	Average (B)
Control	12.57	12.37	12.47 f	0.29	0.35	0.32 a	43.04	35.13	39.09 d	4.57	4.408	4.49 l
Dormex at 2 %	13.80	13.03	13.42 cde	0.21	0.26	0.24 cd	67.80	50.41	59.11 bc	4.59	4.52	4.56 k
Dormex at 3 %	14.33	13.70	14.02 bc	0.25	0.32	0.29 ab	58.06	42.67	50.36 c	4.63	4.62	4.63 j
Dormex at4 %	14.50	14.53	14.52 ab	0.25	0.32	0.29 ab	59.72	45.64	52.68 c	5.05	4.97	5.08 a
Milagro at 4 %	13.53	12.90	13.22 de	0.21	0.26	0.24 cd	66.70	49.79	58.25 bc	4.68	4.66	4.67 i
Milagro at 5 %	13.90	13.23	13.57 ced	0.23	0.31	0.27 bc	59.57	43.74	51.66 c	4.72	4.67	4.69 h
Milagro at 6 %	14.43	13.73	14.08 bc	0.25	0.34	0.29 ab	59.37	40.94	50.15 c	4.78	4.68	4.73 g
Mineral oil at 2 %	13.10	12.87	12.98 ef	0.23	0.28	0.26 bc	56.08	47.27	51.68 c	4.81	4.75	4.78 f
Mineral oil at 4 %	14.20	13.37	13.78 cd	0.23	0.29	0.26 bc	60.88	45.78	53.33 c	4.86	4.82	4.84 e
Mineral oil at 6 %	15.10	14.70	14.90 a	0.16	0.22	0.19 e	95.45	68.64	82.05 a	4.92	4.83	4.88 d
Thiourea at 1 %	12.57	12.57	12.57 f	0.16	0.23	0.20 de	79.42	53.79	66.60 b	4.96	4.90	4.93 c
Thiourea at 5 %	15.17	15.03	15.10 a	0.23	0.29	0.26 bc	65.18	51.68	58.43 bc	5.01	4.94	4.98 b
Average (A)	13.93 a	13.50 b		0.23 b	0.29 a		64.61 a	47.65 b		4.80 a	4.73 b	
LSD at 5% for: Date(A):	0.25			0.02			4.04			0.02		
Treatment (B):	0.62			0.40			9.89			0.07		
Interactions (A× B)	0.87			0.06			13.99			0.01		

Concerning to the effect of Dormex, Milagro, mineral oils and Thiourea on TSS/ acid ratio, revealed that similar trend was found due to those treatments on the TSS in fruit juice. Since, trees sprayed with both Thiourea and mineral oil gave a higher significant values of TSS/ acid ratio than those sprayed with Dormex, Milagro or the untreated ones. Furthermore, spraying trees with mineral oil induced a higher values of TSS/ acid ratio in fruit juice than those sprayed with Milagro during both seasons of the study. Data in the same table also showed that Dormex, Milagro, mineral oils and Thiourea treatments significantly increased total sugars (% of fruit dr.wt.) of 'Le Conte' pear cultivar fruits when compared with that of untreated trees in the two studied seasons. In addition, pear trees sprayed with both Dormex and Thiourea gave a higher significant values of total sugars percentages than those sprayed with Milagro, and mineral oils or the control. Moreover, spraying pear trees with Dormex at concentration (4%) induced a higher values of total sugars percentage in fruit than those sprayed with

Thiourea at concentration (5 %) during both seasons of the study.

Regarding to the time of treatments all dormancy breaking treatments on 5th Feb. significantly produced a superiorof chemical characteristics than spraying on 20th Feb. treatments in the two studied seasons.These results are in parallel with the findings by **El-Kassas *et al.* (1996)**on peach and nectarine, who reported that hydrogen cyanamide application increased TSS while acidity was decreased. Similarly, **Kabsha (2017)** workedon Florida Prince peach trees reported that foliar application of Dormex, Milagro, mineral oils before bud burst by 7 to 10 days was the best treatment for improving fruit quality comparing with that of control.

Table (5): Effect of some dormancy braking treatments at different dates on some fruit chemical characteristics of 'Le Conte' pear cultivar during 2016 season.

Character.	T.S.S (%)			Total acidity(%)			TSS / Acid ratio			Total sugars (% of fruit dr.wt.)		
Dateof spraying / Treatment	Feb. 5th	Feb. 20th	Average (B)	Feb. 5th	Feb. 20th	Average(B)	Feb. 5th	Feb. 20th	Average (B)	Feb. 5th	Feb. 20th	Average (B)
Control	13.73	12.70	13.22 g	0.35	0.34	0.35 a	93.40	37.72	38.56 d	4.57	4.41	4.49 i
Dormex at 2 %	13.93	14.30	14.12 def	0.26	0.22	0.24 cde	53.76	66.96	60.36 b	4.59	4.52	4.56 k
Dormex at 3 %	14.50	14.30	14.40 cde	0.31	0.26	0.29 bc	47.08	55.29	51.59 bc	4.63	4.62	4.63 j
Dormex at4 %	14.77	14.87	14.82 bc	0.26	0.31	0.29 bc	57.04	49.04	53.04 bc	5.05	4.97	5.08 a
Milagro at 4 %	14.17	13.83	14.00 def	0.22	0.26	0.24 cde	65.94	52.94	59.44 b	4.68	4.66	4.67 i
Milagro at 5 %	14.73	13.83	14.28 cdef	0.25	0.31	0.28 bc	59.39	45.55	52.47 bc	4.71	4.67	4.69 h
Milagro at 6 %	14.97	14.20	14.58 cd	0.34	0.31	0.32 ab	44.56	46.84	45.70 cd	4.78	4.68	4.73 g
Mineral oil at 2 %	13.93	13.80	13.87 ef	0.26	0.26	0.26 cd	53.78	53.20	53.49 bc	4.81	4.75	4.78 f
Mineral oil at 4 %	14.00	14.60	14.30 cdf	0.29	0.26	0.28 bc	47.98	56.38	52.18 bc	4.86	4.82	4.84 e
Mineral oil at 6 %	15.77	14.87	15.32 ab	0.18	0.22	0.20 e	93.11	69.22	81.97 a	4.92	4.84	4.88 d
Thiourea at 1 %	13.73	13.70	13.72 fg	0.22	0.22	0.22 de	64.38	63.69	64.04 b	4.97	4.89	4.93 c
Thiourea at 5 %	15.17	15.93	15.55 a	0.25	0.31	0.28 bc	61.16	52.40	56.78 bc	5.01	5.49	4.98 b
Average (A)	14.45 a	14.24 a		0.27 a	0.27 a		57.37 a	54.13 a		4.80 a	4.73 b	
LSD at 5% for: Date(A):	0.21			0.02			4.68			0.03		
Treatment (B):	0.52			0.04			11.47			0.07		
Interactions (A× B)	0.73			0.07			16.22			0.01		

We can come to the conclusion that some dormancy braking treatmentsat various dates had simultaneously affected on some fruit physical characteristics of 'Le Conte' pear cultivartrees such as fruit weight, volume, length, diameter and firmness of ‘Le Conte’ pear cultivar fruits. These parameters were positively affected by all treatments in comparison to that of the control trees. In addition, pear trees sprayed with Thiourea gave a higher significant values of fruit weight, volume, diameter andfirmness than those sprayed with Dormex, mineral oil or Milagro. Pear trees sprayed with Thiourea and mineral oil at 6 % gave a higher significant values of fruit T.S.S (%)than those sprayed with Dormex or Milagro regardless the effect of concentrations within each breaking material alone trees sprayed with mineral oil at 6 % gave lower values of total acidity than others did in the two studied seasons. Data in the same table also showed that Dormex, Milagro, mineral oils and Thioureatreatments significantly increased total sugars (% of fruit dr.wt.) of ‘Le Conte’ pear cultivar fruits when compared with that of untreated trees in the two studied seasons. Pear trees sprayed with both Dormex and Thiourea gavea higher significant values of total sugars percentages than those sprayed with Milagro, and mineral oils or the control. Spraying pear trees with Dormex at concentration (4%) produced a higher values of total sugars percentage in fruit than those sprayed with Thiourea at concentration (5 %) during both seasons of the study.

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