Journal of Horticultural Science & Ornamental Plants 7 (1): 39-47, 2015
ISSN 2079-2158

DOI: 10.5829/idosi.jhsop.2015.7.1.1154

Enhancing the Performance of "Florda Prince" Peach Cultivar with Growth Promoter "Brassinolide" and Break Agent "Hydrogen Cyanamide"

Soaad A. Mohamed and Hanaa M. Sherif

Deciduous Fruit Department, Hort. Res. Inst., Agric. Res. Center, Giza, Egypt

Abstract: Effects of some substances application as Brassinolide (Millagrow) and hydrogen cyanamide (Dormex) on the accelerate flowering and cropping of peach trees cv. "Florda Prince" (*Prunus Persica* L. Batch) were determined during 2010/2011 and 2011/2012 studied seasons. All growth parameters were positively affected by spraying both chemicals than control. Trees attained flowering and fruit set average two weeks earlier than control, also, progressive increment in flowering% & vegetative buds% were related to the Dormex or brassinolide (Millagrow) in spraying solution. Trees sprayed with 0.2% brassinolide (Millagrow) recorded the highest N&K leaf content. Also, trees treated with Dormex 0.5% +0.2 or 0.1% brassinolide recorded the highest fruit set percentage and the biggest yield (kg/tree). Gradually increment of fruit weight, volume and dimensions values was noticed with all treatments especially with Dormex 0.5% +0.2% brassinolide (Millagrow) or 0.2% brassinolide (Millagrow). In addition, brassinolide at 0.2% or Dormex 0.5 % +0.2% brassinolide (Millagrow) gave the highest fruit thickness and the lowest seed weight. All treatments significantly decreased fruit firmness compared to control especially with 0.2% brassinolide. Also, all investigated treatments increased total soluble solids (TSS), TSS/acid ratio and decreased acidity percentage of fruit juice content. Generally, Dormex 0.5% +0.2% brassinolide or 0.2% brassinolide were more effective than other treatments.

Key word: Brassinolide (Millagrow) · Hydrogen Cyanamide (Dormex) · Blooming · Fruit set · Yield · Fruit quality · Peach trees

INTRODUCTION

Peach tree is one of the most important deciduous fruit trees grown in Egypt. Extension of the cultivated area nowadays is due to its highly economic value, exporting potential and introducing low chilling peach cultivars such as "Florda Prince" [1, 2]. Peach cv. "Florda Prince" is an early ripening variety under local environmental condition. It recorded superior yield and it exhibited a high adaptation with the local environmental conditions [3].

Brassinolide (BL) a plant growth-promoting steroid isolated from *Brassica napus* pollen. Brassinolide was the first isolated brassinosteroid in 1979, when pollen from *Brassica napus* was shown to promote stem elongation and cell divisions and the biologically active molecule was isolated [4, 5]. BRs have been shown to be involved in numerous plant processes such as promotion of cell expansion and cell elongation according to Clouse and Sasse [6] it works with auxin to do so Nemhauser *et al*. [7], it has an unclear role in cell division and cell wall regeneration. Promotion of vascular differentiation; BR signal transduction has been studied during vascular differentiation. Hewitt *et al*. [8] and Clouse and Sasse [6] cleared that Br acceleration of senescence in dying tissue cultured cells ; delayed senescence in BR mutants supports that this action may be biologically relevant and can provide some protection to plants during chilling and drought stress. Also, Cano *et al*. [9] showed that it is necessary for pollen elongation for pollen tube formation.

Brassinosteroids (Brs) are poly hydroxylated compounds related to the structure of 5a - cholestane,a chemical structure similar to many organic compounds. The chemical class of brassinosteroids share similar actions of mammalians steroids, but act in plants mostly via genetically mediated factors [10,11]. One of the main sources of brassinosteroids is in pollens in order to induce growth. Brassinosteroids can be synthesized in laboratory settings [12]. Characterization of BR-insensitive mutants show a similar dwarf phenotype has subsequently identified key genes in BR signaling [10,13]. BRs have also been demonstrated to regulate timing of

Corresponding Author: Soaad A. Mohamed, Department of Deciduous Fruit, Hort. Res. Inst., Agric. Res. Center, Giza, Egypt.

flowering and pollen development [14-16]. However, using some phyto hormones as brassinolide (BL) can increase flowering, fruit set and yield by effects on carbohydrate assimilation, allocation and control of aquaporin activities [17]. Brassinosteroids apparently coordinates and integrates diverse processes required for growth, partly via interactions with phytohormones setting the frame for BR responses [11]. Brassinosteroide (BRs) regulate various growth and developmental processes in plants and organ differentiation [18,11, 12]. In addition, the growth induced by brassinolide has been related to increase in RNA and DNA content, polymerase activity, protein synthesis, carbohydrate fraction, reducing sugars, non reducing sugars and starch [19, 20].

Hydrogen cyanamide (Dormex) can break dormancy by increasing respiration, accelerates vegetative and flower and that induces early and more uniform bud break El-Sabagh *et al*. [21] on apple, Williams *et al*. [22] on Blueberry and Sagredo *et al*. [23] on apple. Response of plants to hydrogen cyanamide application varied according to time of application and physiological stage of bud development, amount of chilling accumulated. Hydrogen cyanamide accelerates vegetative and flower bud break and shortens fruit development period (22, 23 and 24) on "Canino" apricot. El-Sabagh *et al*. [21] mentioned that all concentrations of hydrogen cyanamide advanced and improved earlier bud break, fruit set, fruit quality and vegetative growth of "Anna" apple cultivar.

In addition, the response of individual buds to treatment depends on the stage of bud development [25]. Shulman *et al.* [26] reported that when hydrogen cyanamide was applied several weeks before natural bud break in peach, the most consistent and complete bloom development was seen. Moreover, Dormex application advanced full bloom, fruit set and maturity [27]. Fruit from hydrogen cyanamide treated peach trees had higher total soluble solids than control [28].

The purpose of this search was to study the effect of brassinolide (Millagrow), Hydrogen cyanamide (Dormex) and mixture of both at different concentrations on vegetative and flowering buds%, fruit set, yield and fruit characteristics of "Florda Prince" peach cv. grown in sandy soil. Also, the possibility of replacing Dormex partially by other materials to reduce cost, increase nutrients and improve yield quantitatively & qualitatively of "Florda Prince" peach trees.

MATERIALS AND METHODS

The present experiment was carried out during two successive seasons, 2010/2011 and 2011/2012 on 4 years old "Florda Prince" trees (*Prunus persica* L. Batch) budded on Nemaguard. Trees were grown on sandy soil, planted at 3x3m under drip irrigation at a private farm at Sadat city, El-Menoufeia Governorate, Egypt. Trees were subjected to the same horticultural practices that are usually applied in the orchard and eighteen trees were chosen as uniform as possible. Treatments were arranged as a random complete blocks design with three replicates for each treatment where one tree acted as a replicate. Treatments were sprayed as follow:

- Brassinolide* (BL) 2% at 1g / liter (0.1%).
- Brassinolide* (BL) 2%) at 2g / liter (0.2%).
- Hydrogen cyanamide (Dormex) at 0.5%.
- Dormex at 0.5%+ Brassinolide* (BL) 2% at 1g / liter (0.1%).
- Dormex at 0.5%+ Brassinolide* (BL) 2% at 2g / liter (0.2%).
- Control (Trees were sprayed with tap water).

(*Millagrow is a commercial name of Brassinolide (BL) 2% registered by No. 7239 in Ministry of Agriculture)**.**

At both seasons, treatments were applied at 3 weeks before beginning of flowering (the latest of November) when the buds were still dormant.

Ten shoots were tagged randomly in different directions from each tree to observe and determine the following parameters:

- Date of beginning of flowering and fruit set.
- Number of buds that burst was calculated to determine flower, vegetative and dormant buds%.

Flower buds%= Number of flowering buds ÷ Total number of buds × 100

Vegetative buds%= Number of vegetative buds ÷ Total number of buds × 100

Dormant buds%= Number of dormant buds ÷ Total number of buds × 100

- Final fruit set was estimated after full bloom as percentage:

Fruit set (%) = Number of developed fruitlets ÷ Total number of flowers at full bloom x 100

- The yield was measured as kg/tree at harvest time.

- Fruit characteristics: Samples of ten mature fruits from each replicate tree (30 fruits for each treatment) were collected randomly at harvest time and the following characteristics were determined: Average fruit weight (g), fruit dimensions (cm), fruit volume (cm^3), seed weight (g), fruit flesh thickness (cm), fruit firmness ($Ib/inch^2$) by pressure tester using 5/16 plunger, two reading were taken on the flesh of each fruit, total soluble solids (TSS%) in fruit juice by using hand refractometer and acidity of fruit juice was determined (as malic acid) by titration with 0.1 normal sodium hydroxide with phenolphthalein as an indicator, according to A. O. A. C. [29] and Vogel [30]. Also TSS/acid ratio was estimated.

Leaf Mineral Content: Leaf macro-elements content were determined in mid-August of both experimental seasons. Samples of 20 leaves /tree were taken at random from the middle previously tagged shoots of each tree. Leaf samples were washed with distilled water, oven dried at 70°C to a constant weight and grounded. The ground samples were digested with sulphoric acid and hydrogen peroxide according to Evenhuis and Dewaard [31]. Total nitrogen was determined by microkjeldahl method described by Pregl [32], while phosphorus was determined colorimatrically according to Murphy and Reily [33] and K was determined by using an atomic absorption spectrophotometer (330) according to Wilde [34] and were expressed as percent on dry weight basis.

Statistical Analysis: All the obtained data were submitted to variance analysis according to [35] and the means separated by Duncan's multiple range tests at 0.05% [36].

RESULTS AND DISCUSSION

Effect of Treatments on Flowering Development: Data of beginning of flowering and fruit set of "Florda Prince" peach trees as affected by different applied of Millagrow and Dormex treatments are shown in Table (1). It appeared that, all treatments caused an early beginning of flowering and fruit set of "Florda Prince" peach trees as compared to control. In addition, trees sprayed with 0.2% Millagrow or Dormex 0.5% were the earliest in comparing to the control.

These results are in line with those obtained by Kauschmann *et al*. [18] who cleared that brassinolide (BL) has specific effect on differentiation; Mussig [11] reported that physiological pathways of BRs include effects on carbohydrate assimilation and allocation. Additionally, Montoya *et al*. [37] showed that BRs are essential for many physiological functions in plants. As for Dormex, Mahrous and El-Fakharani [38] on "Amar" apricot cv. and El-Sharkawy and Osman [39] on two pecan cv. who found that dormancy breaking agents enhanced flowering and setting time compared to the control. Also, Hegazi [24] found that flowering and harvesting time of "Canino" apricot were enhanced and earlier, also, initial and final fruit set were improved by H_2CN_2 treatments.

Effect of Treatments on Flowering, Vegetative and Dormant Buds: The effect of different applied Millagrow and Dormex treatments on percentage of flowering, vegetative and dormant buds are shown in Table (2). Data revealed that there were significant differences between all the treatments under study and the control. Also, spraying Dormex 0.5% +0.2% Millagrow surpassed all other treatments (52.65, 54.90%) followed by spraying Dormex 0.5% +0.1% Millagrow (with insignificant differences between them) in increasing flowering buds burst% at both seasons under investigation. On the other hand, it is noticed that vegetative buds burst% was increased with spraying 0.2% Millagrow (36.04, 37.63%) followed by Dormex 0.5% + Millagrow at 0.2% at 1st and 2nd seasons. Herein, it reversed on dormant buds%. The highest dormant buds% (32.86, 28.98) was recorded by untreated trees in both seasons under study, respectively.

These results are conveyable with Kauschmann *et al*. [18] who cleared that BRs has specific effect of differentiation. Also, Montoya *et al*. [37] indicated that synthesis activity was observed in the pedicel joints and ovaries by Brs. Moreover, Attala and Stino [40] revealed

Table 1: Effect of Millagrow and Dormex on beginning of flowering and fruit set "Florda Prince" peach trees during 2010/2011 and 2011/2012 seasons

	Beginning of flowering		Beginning of fruit set	
Treatments	Season2010/2011	Season2011/2012	Season2010/2011	Season2011/2012
Control	30/12	28/12	5/1	3/1
Millagrow 0.1%	16/12	14/12	22/12	20/12
Millagrow 0.2%	14/12	12/12	19/12	18/12
Dormex 0.5%	14/12	12/12	20/12	18/12
Dormex+Millagrow0.1%	16/12	14/12	20/12	20/12
Dormex+Millagrow0.2%	16/12	14/12	20/12	20/12

Table 2: Effect of Millagrow and Dormex on flowering buds (%), vegetative buds (%) and dormant buds (%) of "Florda Prince" peach trees during 2010/2011 and 2011/2012 seasons

	Flowering buds (%)		Vegetative buds (%)		Dormant buds (%)	
Treatments	Season 2010/2011	Season 2011/2012	Season 2010/2011	Season 2011/2012	Season 2010/2011	Season 2011/2012
Control	41.12 e	43.12d	26.02 d	27.90 c	32.86a	28.98a
Millagrow 0.1%	44.25 d	46.30 c	30.40 bc	32.50 b	25.35b	21.20b
Millagrow 0.2%	48.10bc	49.80 b	36.04 a	37.63 a	15.86c	12.57c
Dormex 0.5%	46.30cd	48.52bc	28.06cd	29.68bc	25.64b	21.80b
Dormex+ Millagrow 0.1%	50.30ab	52.60 a	31.85bc	33.80ab	17.85c	13.60c
Dormex+ Millagrow 0.2%	52.65 a	54.90 a	34.12ab	34.80 ab	13.23d	10.30d

Means within each column followed by the same letter (s) are not significantly different at 5% level.

Table 3: Effect of Millagrow and Dormex on leaf content of N (%), P (%) and K (%) of "Florda Prince" peach trees during 2010/2011 and 2011/2012 seasons

	N (%)		P (%)		K (%)	
Treatments	1st season	2nd season	1st season	2nd season	1st season	2nd season
Control	2.22 c	2.30 c	0.20 a	0.24 a	1.65 c	1.72 c
Millagrow 0.1%	2.48 ab	2.58 ab	0.23 a	0.30 a	1.92 ab	1.97 a
Millagrow 0.2%	2.55 a	2.67 a	0.26 a	0.30 a	1.99 a	2.01 a
Dormex 0.5%	2.25 c	2.35 c	0.21 a	0.26 a	1.71 c	1.80 bc
Dormex+Millagrow 0.1%	2.38 a-c	2.38 c	0.22 a	0.28 a	1.78 bc	1.85 b
Dormex+ Millagrow 0.2%	2.31 bc	2.42 bc	0.22 a	0.29 a	1.86 ab	1.90 ab

Means within each column followed by the same letter (s) are not significantly different at 5% level.

Table 4: Effect of Millagrow and Dormex on fruit set (%) and yield (Kg/tree) of "Florda Prince" peach trees during 2010/2011 and 2011/2012 season

	Fruit set (%)		Yield (kg/tree)	
Treatments	1st season	2nd Season	1st Season	2nd Season
Control	18.67 f	20.20 f	38.40 d	43.32 d
Millagrow 0.1%	21.15 e	23.30 e	40.60 cd	44.39 cd
Millagrow 0.2%	28.00 c	30.02 c	47.60 b	51.01 b
Dormex 0.5%	25.00 d	25.91 d	43.32 c	48.40 bc
Dormex+Millagrow 0.1%	30.31b	33.30 b	50.71 ab	55.52 a
Dormex+ Millagrow 0.2%	32.51 a	36.06 a	53.85 a	58.20 a

Means within each column followed by the same letter (s) are not significantly different at 5% level.

that H_2CN_2 at different levels and time of application improved bud burst. Moreover, Ismail *et al*. [41] stated that H_2CN_2 treatments increased pear flowering bud break per spur and number of flowers/spur. Also, Hegazi [24] reported that flower and vegetative bud percentages were increased by Dormex application.

Effect of Treatments on Leaf Mineral Content: Data presented in Table (3) showed that spraying Millagrow gave the highest and significant increase of nitrogen and potassium concentrations of leaves of "Florda Prince" trees compared with control during the two seasons. It is clearly that Millagrow at 0.2% was more effective in N accumulation (2.55, 2.67%) and K (1.99, 2.01%) during the two seasons, respectively. It followed by 0.1% Millagrow, then Dormex+0.2% Millagrow (with insignificant differences between them). Whereas, the treatments did not affect on P leaf content. Generally, control trees recorded the lowest values of N (2.22, 2.30) and K (1.65, 1.72) at both seasons, respectively.

However, Homo brassinolide, increased nitrogen fixation and enhance soluble protein content and photosynthesis [6]. In addition, Montoya *et al*. [37] showed that brassinosteroids are essential for many physiological functions in plants.

Effect of Treatments on Fruit Set and Yield: Data in Table (4) indicate that fruit set and yield were affected by different applied treatments in both studied seasons. All spraying treatments of Millagrow and Dormex significantly increased fruit set% and yield (kg/tree) compared with the untreated trees. The highest significant

Table 5: Effect of Millagrow and Dormex on fruit weight (g), fruit volume (cm^3), fruit length (cm) and fruit diameter (cm) of "Florda Prince" peach trees during 2010/2011 and 2011/2012 seasons

	Fruit weight(g)		Fruit volume (cm^3)		Fruit length (cm)		Fruit diameter (cm)	
Treatments	1st Season	2nd Season	1st Season	2nd Season	1st Season	2nd Season	1st Season	2nd Season
Control	84.87 e	88.73 d	83.90 d	84.50 d	5.20 d	5.35 d	5.42 d	5.47 d
Millagrow 0.1%	91.05 cd	94.23 c	90.01 cd	90.35 cd	5.56 c	5.61 bc	5.60 cd	5.60 cd
Millagrow 0.2%	100.52 b	103.46 ab	98.80 ab	99.63 ab	6.08 a	5.91 a	5.96 ab	5.87 b
Dormex 0.5%	87.90 de	90.92 cd	86.43 d	87.52 cd	5.32 d	5.47 cd	5.52 d	5.55 cd
Dormex+Millagrow 0.1%	94.40 c	99.58 b	93.20 bc	94.10 bc	5.62 c	5.74 b	5.80 bc	5.73 bc
Dormex+Millagrow 0.2%	106.60 a	107.39 a	101.27 a	106.52 a	5.86 b	6.06 a	6.20 a	6.09 a

Means within each column followed by the same letter (s) are not significantly different at 5% level.

Table 6: Effect of Millagrow and Dormex on seed weight (g), fruit thickness (cm) and fruit firmness (Ib/$inch^2$) of "Florda Prince" peach trees during 2010/2011 and 2011/2012 seasons

	Seed weight (g)		Fruit thickness (cm)		Fruit firmness (Ib/$inch^2$)	
Treatments	1st season	2nd season	1st season	2nd season	1st season	2nd season
Control	11.60 a	12.40 a	1.41 c	1.43 e	12.15 a	11.40 a
Millagrow 0.1%	11.10 ab	12.00 a	1.50 bc	1.56 de	10.54 de	9.92 e
Millagrow 0.2%	9.20 d	9.80 c	2.16 a	2.12 a	10.28 e	9.68 f
Dormex 0.5%	10.50 a-c	11.30 ab	1.60 bc	1.68 cd	11.45 b	10.75 b
Dormex+Millagrow 0.1%	10.00 b-d	10.70 bc	1.73b	1.83 bc	11.08 c	10.41 c
Dormex+Millagrow 0.2%	9.70 cd	10.00 c	2.23 a	2.23 ab	10.83 cd	10.18 d

Means within each column followed by the same letter (s) are not significantly different at 5% level.

fruit set (32.51&36.06%) and yield (53.85&58.20 Kg/tree) were obtained by Dormex 0.5% +0.2% Millagrow followed by Dormex 0.5% +0.1% Millagrow compared with the control for fruit set (18.67, 20.20%) and yield (38.40, 43.32kg/tree) at both seasons, respectively.

The increment in the yield could be explained as a result of increasing flowering and vegetative bud percentages and the macro-elements (N, K) concentration in the leaves of sprayed trees than the control during the two studied seasons. These results are in parallel with those of Son and Kuden [42] on apricot and plum and El-Sharkawy and Osman [39] on pecan who showed that H_2CN_2 treatments improved fruit set and increased yield as weight and number of fruits per tree. Also, Gabr *et al*. [43] revealed that BRs and Dormex treatments significantly increased the yield of "Canino" apricot trees.

In addition, Vardhini and Rao [20] and Hayat *et al*. [44] supported these results and explanation where reported that yield increase in fruit trees may be related to improvement in the assimilation efficiency of photosynthetic carbon and protein biosynthesis of the sprayed trees. Furthermore, Mussig [11] cleared that BRs are known to facilitate pollen tube growth and decreased flowers drop in pomegranate. Reduced flowers drop and increase in fruit set may be due to the effect of cytokinins and auxins through preservation of loss of protein material in middle lamella according to Kachave and Bhosale [45] on grape and Abubakar *et al.* [46] on pomegranate. Subsequently, it is reflecting on yield increase.

Effect of Treatments on Physical Fruit Properties: Effect of spraying Millagrow and Dormex on some physical fruit characteristics of "Florda Prince" peach cv. trees are presented in Table (5 and 6).

Obtained data in Table (5) cleared the effect of Millagrow and Dormex treatments on weight, volume and dimensions of "Florda Prince" fruits. These characters were positively affected by all treatments at both studied seasons as compared with the control. Noticeably, Dormex 0.5% +0.2%Millagrow spray significantly increased fruit weight (106.6, 107.39 g), fruit volume (101.27, 106.52cm^3) and fruit diameter (6.20, 6.09cm) at both seasons. Also, fruit length significantly increased by Dormex 0.5% +0.2% Millagrow in the 2nd season or by 0.2%Millagrow at both seasons more than the other treatments. The lowest values were related to the control trees, (84.87, 88.73g), (83.90, 84.50cm^3) and (5.20, 5.35cm & 5.42, 5.47cm) for fruit weight, volume and dimensions, at the two studied seasons, respectively.

In this respect, El-Sharkawy and Osman [39] on pecan and Hegazi [24] on apricot recorded that H_2CN_2 increased fruit weight, volume, length and diameter, while Gabr *et al.* [43] on apricot, revealed that dormex did not

Table 7: Effect of Millagrow and Dormex on TSS (%), acidity (%) and T.S.S/acidity fruit content of "Florda Prince" peach trees during 2010/2011 and 2011/2012 seasons

	T.S.S (%)		Acidity (%)		T.S.S/acidity	
Treatments	1st Season	2nd Season	1st Season	2nd Season	1st Season	2nd Season
Control	10.45 c	10.30 c	0.663 a	0.720 a	15.96 d	14.40 d
Millagrow 0.1%	11.07 c	11.20 c	0.600 ab	0.660 ab	18.50 d	17.00 d
Millagrow 0.2%	12.90 ab	14.00 a	0.450 cd	0.430 e	29.34 b	32.70 a
Dormex 0.5%	11.35 c	10.70 c	0.560a-c	0.600bc	20.50 cd	17.99 d
Dormex+Millagrow0.1%	12.50 b	12.50 b	0.510 b-d	0.550 cd	24.63 c	22.78 c
Dormex+ Millagrow 0.2%	13.55 a	13.05 ab	0.400d	0.480 de	34.72 a	27.41 b

Means within each column followed by the same letter (s) are not significantly different at 5% level.

differentiate than control. Also, he reported that the increment of fruit weight, volume, length and diameter values were linearly related to the BRs concentration on spraying solution. Moreover, brassinolide stimulate cell elongation and cell division [18]. The fruit growth induced by brassinolide has been related to promote photosynthesis accumulation in fruits or an increase in RNA and DNA content, polymerase activity and protein synthesis [47, 48].

Data revealed in Table (6) that seed weight (g) was significantly smaller with Millagro at 0.2% (9.2 and 9.8g) followed by Dormex 0.5% +0.2% Millagro (9.7 and 10.00g) through 2010/2011 and 2011/2012 seasons, respectively. Also spraying Millagrow at 0.2% or Dormex 0.5% +Millagrow 0.2% significantly improved fruit thickness (with insignificant differences between them) compared with the other treatments and control. As for fruit firmness, both of Millagrow and Dormex either each alone or mixture of them significantly reduced fruit firmness to be more suitable than control. However, Dormex 0.5% spraying alone recorded the highest significant values of fruit firmness (11.45&10.75 Ib/inch^2) comparing with the other treatments during the two seasons, respectively.

These results are in agreement with investigators, Hegazi [24] who reported that Dormex treatment improved fruit flesh weight, seed weight and reduced firmness of “Canino” apricot fruit. Also, Ismail *et al*. [41] found that Dormex reduced pear fruit firmness. Furthermore, Symons *et al*. [49] verified that BRs promoted ripening in grape, also, reduced "Canino" fruit firmness [43]. On the other hand, Millagrow treatment increased fruit firmness of “Le Conte” pear [50].

Chemical Fruit Properties: Chemical properties of fruits are demonstrated in Table (7) it is obvious that all treatments increased TSS and decreased acidity compared to the control. Higher values of total soluble solids, TSS/acid ratio and lower acid content were accompanied with Dormex+Millagrow at 0.2% and Millagrow at 2% treatments (with insignificant differences between them) in both seasons compared with other treatments. On the other hand, control or Dormex 0.5% or Millagrow at 0.1% treatments gave the lowest TSS%, TSS/acid ratio and highest acidity% values.

These results are supported by those obtained by Ismail *et al*. [41] and Hegazi [24] who found that Dormex increased TSS fruit content of pear and apricot. Also, Gabr *et al*. [43] reported that Dormex increased SSC and decreased acidity percentage of apricot fruits. Concerning of BRs, Symons *et al*. [49] showed that application of BRs on grape berries promoted ripening. Also, Gomes *et al*. [51] achieved that Brs increased SSC content of passion fruit. On the other hand, Bahlool *et al*. [52] and Ismail *et al*. [41] found that acidity was not affected with dormex application. Moreover, Fathi *et al*. [50] revealed that Millagrow application gave the lowest values of TSS and the highest values of acidity on “Le-Conte” pear fruits.

CONCLUSION

It could be concluded that Dormex at 0.5%+0.2% Millagrow or Millagrow at 0.2% were the most effective treatments for increasing the yield and fruit quality. Regarding the applied treatments could be arranged according to their positive effects as follows statistically: Dormex 0.5%+ 0.2%Millagrow> Dormex 0.5%+ 0.1% Millagrow% >Millagrow at 0.2% > Millagrow at 0.1% > Dormex at 0.5% > control. So, we can recommend "Florda Prince" cv. growers to spray their trees with 0.5% Dormex+0.2%Millagrow at 3 weeks before bud burst.

REFERENCES

1. F.A.O., 2010. The state of food insecurity in the world. www.fao/org/docrep /013/11683 eoo. htm
2. El-Baz, E.T., A.A. Arafa and W.M. Awad, 2007. Comparative study on growth and fruiting of some peach cultivars growing in two different locations. J. Agric. Sci., Mansura Univ., 52(8): 5863-5873.

3. Shaltout, A.D., 1987. 'Florda Prince' a promising peach cultivar recently introduced to Egypt. Bull. Fac. of Agric., Cairo Univ., 38: 381-391.
4. Grove, M.D., G.F. Spencer, W.K. Rohwedder, N. Mandava, J.F. Worley, J.D. Warthen, J.L. Ste Flippen-Anderson and J.C. Cook, 1979. Brassins: a new family of plant hormones from rape pollen. Nature, 225(5237): 1065-66. Bibcode:1970Natur. 225.1065M.
5. Grove Michael, D., F. Spencer, Gayland Rohwedder, William K. Mandava, Nagabhushanam Worley, Joseph F. Warthen, J. David Steffens, George L. Flippen-Anderson, Judith L. Cook and J. Carter, 1979. Brassinolide, a plant growth-promoting steroid isolated from *Brassica napus* pollen. Nature, 281(5728): 216-217. Bibcode:1979 Natur., 281..216G
6. Clouse, S.D. and J.M. Sasse, 1998. Brassinosteroids: Essential regulators of plant growth and development. Annu. Rev. Plant Physiol. Plant Mol. Biol., 49: 427-451. [PubMed].
7. Nemhauser, L. Jennifer, Mockler C. Todd and Chory Joanne, 2004. Inter dependency of Brassinosteroid and auxin signaling in arabidopsis. PLoS Biology, 2(9): e258. doi10.1371/ journal. Pbio. 0020258. PMC 509407. PMID 15328536
8. Hewitt, F.R., T. Hough, P.O. Neill, J.M. Sasse, E.G. Williams and K.S. Rowan, 1985. Effect of brassinolide and other growth regulators on the germination and growth of pollen tubes of "Prunus avium" using a multiple hanging drop assay". Aust. J. Plant Physiol., 12(2): 201-11. doi:10.1071/ PP9850201.
9. Caño-Delgado, A., Y. Yin, C. Yu, D. Vafeados, S. Mora-Garcia, J.C. Cheng, K.H. Nam, J. Li and J. Chory, 2004. BRL1 and BRL3 are novel brassinosteroid receptors that function in vascular differentiation in Arabidopsis. Development (Cambridge, England), 131(21): 5341-51. doi:10.1242/dev.01403. PMID 15486337
10. Bishop, G.J. and T. Yokota, 2001. Plants steroid hormones, brassinosteroids: Current highlights of molecular aspects on their synthesis/metabolism, transport, perception and response. Plant Cell Physiol., 42: 114-120. [PubMed].
11. Müssig, C., 2005. Brassinosteroid-promoted growth. Plant Biol., 7(2): 110-117.
12. Gonzalez-Garcia, M.P., J. Vilarrasa-Blasi, M. Zhiponova, F. Divol, S. Mora-Garcia, E. Hacham Y.N. Holland, C. Butterfield, S. Ubeda-Tomas, M.J. Bennett, J. Chory and S. Savaldi-Goldstein, 2011. Brassinosteroid perception in the epidermis controls root meristem size. Development, 138: 839-848. [PMC free article].
13. Li, J.M. and K.H. Nam, 2002. Regulation of brassinosteroid signaling by a GSK3/SHAGGY-like kinase. Science, 295: 1299–1301. [PubMed].
14. Yu, X., L. Li, M. Guo, J. Chory and Y. Yin, 2008. Modulation of brassinosteroid-regulated gene expression by Jumonji domain-containing proteins ELF6 and REF6 in Arabidopsis. Proc. Natl. Acad. Sci., USA, 105: 7618-7623. [PMC free article].
15. Domagalska, M.A., E. Sarnowska, F. Nagy and S.J. Davis, 2010. Genetic analyses of interactions among Gibberellin, Abscisic Acid and Brassinosteroids in the control of flowering time in Arabidopsis thaliana. PLoS One, 2010:5. [PMC free article] [PubMed].
16. Ye, Q., W. Zhu, L. Li, S. Zhang, Y. Yin, H. Ma and X. Wang, 2012. Brassinosteroids control male fertility by regulating the expression of key genes involved in Arabidopsis anther and pollen development. Proc. Natl. Acad. Sci., USA, 107: 6100-6105. [PMC free article]
17. Hormaza, J.I. and M. Herrero, 1999. Pollen performance as affected by the pistilar genotype in sweet cherry '*Prunus avium'*. Protoplasma, 208: 129-135.
18. Kauschmann, A., A. Jessop, C. Konc, M. Szekeres, L. Willmitzer and T. Altmann, 1996. Genetic evidence for an essential role of brassinosteroids in plant development. The Plant Journal, 9(5): 701-713.
19. Kalinich, J.F., N.B. Mandava and J.A. Todhunter, 1985. Relationship of nucleic acid metabolism to brassinolide-induced responses in beans. J. Plant Physiol., 120: 207-214.
20. Vardhini, B.V. and S.S.R. Rao, 1998. Effect of brassinosteroids on growth, metabolit content and yield of Arachis hypo gaea. Phyto Chemistery, 48: 927-930.
21. El-Sabagh, A.S., S.A. Othman and A.N. Al Abdaly, 2012. Performance of "Anna" apple cultivar grown on two different rootstocks in response to hydrogen cyanamide winter spraying. World Journal of Agricultural Sciences, 8(1): 1-12.

22. Williams, J.G., B.E. Maust and E.P. Miller, 2002. Hydrogen cyanamide accelerates vegetative bud break and shortens fruit development period of Blueberry. HortScience, 37: 539-542.
23. Sagredo, K.X., K.I. Theron and N.C. Cook, 2005. Effect of mineral oil and hydrogen cyanamide concentration on dormancy breaking in "Golden Delicious" apple trees. South African Journal of Plant and Soil, 22(4): 251-256.
24. Hegazi, A.A., 2012. Effects of Some dormancy breaking agents on flowering, fruiting and Fruit characteristics of “Canino” apricot cultivar. World Journal of Agricultural Sciences, 8(2): 169-173.
25. Erez, A., S. Lavee and R.M. Samish, 1971. Improved methods for breaking rest in the peach and other deciduous fruit species. J. Amer. Soc. Hort. Sci., 96: 519-522.
26. 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.
27. Kaundal, G.S., R. Khalid, S.S. Brar and K. Rasool, 1998. Effect of Dormex and pruning time on flowering, fruiting and quality of Shan-Punjab peach (*Prunus persica* L. Batsch). Journal of Research, Punjab Agricultural University, 35(1-2): 41-48.
28. North, M.R.M., J.D. Stadler and D.H. Villiers, 1988. Effect of cyanamide and girdling on yield, fruit size and quality of De wet peach. South African J. Plant and Soil, 5(4): 224-226.
29. A.O.A.C., 2005. Official Methods of Analysis. Published by the A.O.A.C. Box 540.
30. Vogel, A., 1968. A Text Book of Quantitative Inorganic Analysis. Longmans, New York, pp: 1216. Wisc., pp: 259-274.
31. Evenhuis, B. and P.W. Dewaard, 1980. Principles and practices in plant analysis inst., Amsterdam Paper, 15: 152-163.
32. Pregl, F., 1945. Quantitative Organic Micro Analysis. 4th ed. J. A. Churchill, L.T.D. London.
33. Murphy, S. and J.P. Reily, 1962. A modified single solution method for the determination of phosphate in natural water. Anal. Chem. Acta, 27: 31-36.
34. Wilde, S.A., R.B. Corey, J.G. Lyer and G.K. Voigt, 1985. Soil and Plant Analysis for Tree Culture, pp: 93-106, 3rd Oxford and IBM. Publishing Co. New Delhi.
35. Snedecor, G.W. and G.W. Cochran, 1990. Statistical Methods.7 th Ed The Iowa state Univ. Press, Ames, Iowa, USA, pp: 593.
36. Duncan, D.B., 1955. Multiple ranges and multiple F. Tests biometrics, 11: 1- 24.
37. Montoya, T., T. Nomura, T. Yokota, K. Farrar, K. Harrison, J.D. Jones, T. Kaneta, Y. Kamiya, M. Szekeres and G.J. Bishop, 2005. Patterns of dwarf expression and brassinosteroid accumulation in tomato reveal the importance of brassinosteroid synthesis during fruit development. Plant J. 2005 Apr; 42(2):262-9. Erratum in: Plant J., 42(5): 783. Jones, Jonathan GD [corrected to Jones, Jonathan DG].
38. Mahrous, H.A.H. and E.M. M. El-Fakharani, 2006. Effect of some dormancy breaking agents on productivity, fruiting quality and powdery Mildew severity of apricot. Acta Hort., 701: 659-664.
39. El-Sharkawy, Sh. M. and I.M. Osman, 2009. Effect of foliar applications of some growth regulators on flowering, fruit production and quality of “Wichita” and “Western Schley” pecan cultivar. Egypt. J. Hort., 36(1): 29-46.
40. Attala, E.S. and R.G. Stino, 1999. Effect of different concentrations and time of application of H_2 CN_2 on vegetative bud burst of (Coeur de pigeon) cherry trees under warm conditions. Proceedings of the 1st Congress of Recent Technologies in Agriculture. Cairo University, Faculty of Agriculture, pp: 48-52.
41. Ismail, A.F., E.A. Kandil and M.M. Nasr, 2006. Utilization of some chemicals for breaking bud dormancy and their effect on flowering and productivity of “Le-Conte” pear trees. Res. J. So. En. Sept., (7) 7: 25-30.
42. Son, L. and . B. Kuden, 2005. Dormex and promalin affects fruit set and earliness of apricot (*Prunus armeniaca*) and plum (*Prunus domestica*) cultivars. New Zealand J. of Crop and Horti. Sci., 33(1): 59-64.
43. Gabr, M.A., M.A. Fathi, I.M. Azza and G.B. Mekhaeil, 2011. Influences of some chemical substances used to induce early harvest of “Canino” apricot trees. Nature and Science, 9: 59-65.
44. Hayat, S., A. Ahmad, M. Mobin, A. Hussain and Q. Fariduddin, 2000. Photosynthetic rate, growth and yield of mustard plants sprayed with 28-homobrassinolide. Photosynthetica, 38: 469-471.
45. Kachave, D.B. and A.M. Bhosale, 2007. Effect of plant growth regulators and micronutrients on fruiting and yield parameters of "Kagzi" lime (*citrus urantifolia*) fruits. Asian J. Hort., 2: 75-79.
46. Abubakar, A.R., A. Naira and A. Moieza, 2013. Effect of bio stimulants on growth, chlorophyll content, flower drop and fruit set of pomegranate Cv. Kandhari Kabuli. Inter. J. of Agric., Enveron. &Tech., 6: 305-309.

47. Krizek, D.T. and N.B. Mandava, 1983. Influence of spectral quality on the growth response of intact bean plants to brassinosteroid, a growth-promoting steroidal lactone. 1. Stem elongation and morphogenesis. Physiologia Plantarum, 57(3): 317-323.
48. Li, J.M. and J. Chory, 1999. Brassinosteroid actions in plants. J. Exp. Bot., 50: 275-282.
49. Symons, G.M., C. Davies, Y. Shavrukov, I.B. Dry, J.B. Reid and M.R. Thomas, 2006. Grapes in steroids. Brassinosteroid are involved in grape berry ripening. Plant Physiol., 140(1): 150-158.
50. Fathi, M.A., A.A. Samia, A.N. Wessam and A. Abd El-Baree, 2013. Effect of CPPU, GA3, Millagrow and Pepton on yield and quality of “Le-Conte” pear trees. Egypt. J. of Hort., 40: 26-39.
51. Gomes, M.M.A., E. Campostrini, N.R. Leal, A.P. Viana, T.M. Ferraz, L.N. Siqueira, R.C.C. Rosa, A.T. Netto, M. Nuñez-Vázquez and M.A.T. Zullo, 2006. Brassinosteroid analogue effects on the yield of yellow passion fruit plants (Passiflora edulis f. flavicarpa). Scientia Horticulturae, 110: 235-240.
52. Bahlool, S. El-Din, H. Mokhtar and A. Bothina Shahin, 1994. Response of "Le-Conte" pear trees to some dormancy breaking agents. Egypt. J. Agric. Res., 7(1): 305-315.