EFFECT OF SOME PEAR ROOTSTOCKS ON GROWTH, FRUITING AND RESISTANCE TO FIRE BLIGHT DISEASE OF "LE-CONTE" PEAR CULTIVAR

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ABSTRACT

This study was carried out during 2012 and 2013 seasons on "Le-Conte" pear trees budded on four rootstocks namely, "Winter Nelis", "Pyrus betulaefolia", "*Pyrus calleryana"* and "*Pyrus communis"*, planted at El-Kanater Horticultural Research Station, Kalubeia governorate, Egyp. This study was planned to evaluate the effect of these rootstocks on some horticultural characters as well as resistance the fire blight disease of "Le-Conte" cultivar.

Trunk and shoot parameters of "Le-Conte" trees were lower on *"P. communis"* and "Winter Nelis" rootstocks than those on "*P. betulaefolia"* and *"P. calleryana"*. Average numbers of spurs and average number of flowers/spurs or/shoot were high on "*P. betulaefolia"*, moderate on "*P. communis"* and "*P. callerya*na" but low on "Winter Nelis".

Full Blooming date was early on "*P. betulaefolia" and "P. calleryana"* (9–12 of March) *which reflected on the production* but late on "*P. communis"* and "Winter Nelis" (14–16 of March). Results cleared that, *"P. betulaefolia"* and "*P. communis"* rootstocks were more productive for "Le-Conte" cultivar than "*P. calleryana"* and "Winter Nelis".

With respect of chemical fruit characters, TSS and TSS/acid ratio were high and acidity was low on "*P. communis"* and 'Winter Nelis", on the other hand, TSS and TSS/acid ratio were low and acidity was high on "*P. calleryana"* and *"P. betulaefolia"*.

However, "*P. calleryana"* and *"P. betulaefolia" rootstocks under nature infection conditions,* expressed resistance to fire blight disease but *"P. communis"* and "Winter Nelis" expressed susceptibility in this respect.

There were a positive relationship between horticultural characters and resistance of pear tree to fire blight disease. "*P. calleryana"* and "*P. betulaefolia"* rootstocks as resistant were early in the flowering (9–12 of March) and had vigorous tree growth as well as fruit juice has less TSS and higher acidity. While "*P.communis"* and "Winter Nelis" rootstocks as susceptible to the disease were *lately flowering (14–16 of March) and had week growth trees. as well as fruit juice has less acidity and higher TSS.*

Hence, P. betulaefolia" and "P. calleryana" showed more resistance to fire blight disease. However, "P. betulaefolia" is considered better rootstock to "Le Conte" cv. than "P. calleryana" which susceptible to lime-induced chlorosis.

Key words: *pear rootstocks, "Winter* Nelis', *"Pyrus betulaefolia", "Pyrus calleryana", "Pyrus communis",* "Le-Conte", fire blight disease, *Erwinia amylovora,* horticultural characters.

INTRODUCTION

"Le Conte" pear cultivar is the main cultivar grown on commonly seedling *"Pyrus communis"* rootstock in Egypt. Total area in Egypt is about 12374 feddan in 2013 and it produces 58852 ton yearly **(Ministry of agriculture, 2013).** Most of this area is concentrated in Menoufeia, Kalubeia and Nubareia governorates. However, **Saied and El-Shall (1987)** found a correlation between growth of "Le Conte" cv. on several rootstocks; i. e. "*P. betulaefol*ia", *"P. calleryana"* and "Winter Nelis" compared with "*P. communis"* seedlings. **El-Shall *et al.* (2001)** reported that cultivated area of pear in Egypt reduced from 14563 feddan in 1996 to 9931 feddan in 2000 and consequently, the yield also decreased from 18 to 1-2 ton/feddan because of the infection of the blight in the last 20 years**.**

Fire blight caused by "Erwinia amylovora" is one of the most important disease of pear trees in many countries of the world. In Egypt the disease was considered as an economic problem and became a destructive disease on pear **(El-Helaly et al., 1964; Abo El-Dahab et al., 1983 and Tawfik et al., 2000 and 2002).**

"Pyrus calleryana" trees are vigorous and usually bloom early. Nearly all selections, including the "Bradford" cultivar are high resistant to fire blight and insect pests. However other *"P. calleryana"* are susceptible to fire blight **(Westwood and Lombard, 1969.** However, "Winter Nelis" is a very good cv. but quite small late dessert pear and may need thinning to produce good sized fruit. Also, it is high susceptible to fire blight, very susceptible to disease and slightly resistant to Mildew **(Koski and Jacobi, 2013)**. The benefits of using "Winter Nelis" as a rootstock include: (1) trees with a consistent size and productivity (2) tolerance of multiple soil conditions (except for heavy clay) and (3) tolerance of psylla feeding insect without decreased fruit production. However, "Winter Nelis" seedlings are susceptible to fire blight, crown gall and have vigorous growth **(Stebbins, 1995)**. Moreover, *"P. communis"* seedlings gave very good top growth and deep roots, while it shows high susceptibility to pear blights **(Roper, 2001)**.

In addition, **Stebbins (1995)** reported that "*P. communis"* is lack fire blight resistance and *"P. betulaefolia"* seedlings are not resistant to fire blight but it used in the last few years in a commercial scale.

All pear trees on seedling roots are susceptible to fire blight **(Roper, 2001)**. Furthermore, **Beutel (1990)** reported that the best rootstock for "Bartlett" scions was *"P. betulaefolia"* and "Winter Nelis" for "D, Anjou' scion. Some of "*P. communis"* cultivars (Old Home and Professeur Molon) are highly resistant to fire blight. Other cultivars are variably resistant such as "Douglas", "Le Conte' and "Winter Nelis" **(Vander Zwet and Keil, 1979)**. In general, they stated that the five most important Pyrus species ranked in descending order as to their degree of blight resistance are "ussuriensis", "calleryana", "betulaefolia", "byrifolia' and "communis". Furthermore chinese Asian pear varieties are grow well on either *"P. communis"* or "*P. betulaefolia"* rootstock, also, betch seedlings are adapted to poorly drained or wet soils. Trees are more vigorous and give large fruits. This rootstock tends to produce deep roots, so it performs well on droughty soils**.**

The present investigation was conducted to study the effect of four pear rootstocks on horticultural characteristics (vegetative growth, flowering date, physical and chemical fruit characters, yield) and severity of fire blight disease of "Le-Conte" pear cultivar under natural infection.

MATERIALS AND METHODS

The present experiment carried out during, 2012 and 2013 seasons on "Le-Conte" cultivar pear trees (23-old-year) budded on four rootstocks namely, "*Prunus betulaefolia"* (betch), "*P. calleryana" (P.call), "P. communis"* and *"Winter Nelis"* (WN), at El-Kanatar Horticultural Research Station, Gezeret El-Sheair, Kalubeia governorate, Egypt. Trees were planted at 5x5 meters apart on clay loamy soil and supplied with surface irrigation system. Three replicates were applied for each rootstock and each replicate contained five trees. The experiment was as a randomized complete blocks design. Horticultural characteristics (vegetative growth characters, flowering, yield, physical and chemical fruit characters), in addition, the effect of the mentioned rootstocks on the severity of fire blight disease were studied through the following parameters:

1. Vegetative growth parameters:

Tree height (m) and trunk circumference (cm) were measured at the end of the growing season at 10cm above the budding area. Also, four shoots per tree in different directions were selected to determine length (cm) and diameter (cm) for each rootstock, at the end of growing season **(Hassan, 2006).**

2. Flowering:

Four shoots per tree were selected to calculate flowering (spurs number, flowers number/spur or /shoot and full bloom date) in spring season **(El-Shall *et al.*, 1993).**

3. Fruit set and yield:

Percentage of fruit set was calculated during growing season. The yield (Kg/tree) was estimated at harvest.

4. Physical and chemical fruit characters:

Twenty fruits were randomly taken from each replicate to study the physical fruit characters [weight (g), size (cm^3), length (cm), diameter (cm)] at harvest time. Also fruit firmness ($Ib/inch^2$) using a 5/16 plunger, twice readings were measured on the flesh of each fruit. In addition, chemical fruit characters were determined {TSS by hand refractometer, acidity% (as malic acid in juice) and TSS/acid ratio} according to **(A. O. A. C., 1985).**

5- Severity of fire blight disease:-

Severity of fire blight disease was recorded during spring season per tree according to number of infected spurs invided on total number of spurs x 100. Each treatment was contained fifteen trees as replicates. Percentage of infection **(Abd El-Ghaffar, 1994)** was calculated as following**:**

$$\text{Infection percentage (IP)} = \frac{\text{No. of infection spurs}}{\text{Total number of spurs per tree}} \times 100$$

Statistical analysis:

Statistical analyses were performed using the variance analysis according to **(Snedecor and Cochran, 1980)**. Differences between treatments were compared by Duncan's multiple range tests at 0.05% **(Duncan, 1955)**.

RESULTS AND DISCUSSIONS

1- Vegetative growth parameters: -

Data in Table (1) showed that growth parameters of "Le Conte" cv. trees were affected by budding on different rootstocks, (*P. betulaefolia, P. calleryana, P.communis* and Winter Nelis). Since, Tree and shoot parameters showed less value on *P. communis*. Tree height and trunk circumference were 4.40–4.23m and 20.56–18.78cm, also, shoot length and diameter were 55.35–55.00cm and 11.73–12.53cm at first and second seasons, respectively. Winter Nelis rootstocks had tree height and trunk circumference were 5.00–5.17m and 24.73–20.32cm, and shoot length and diameter were 58.20–59.41 and 13.40–14.25cm, respectively.

Meantime, *P. betulaefolia* tree height and trunk circumference were 5.32–5.54 and 28.09–22.65cm and shoot length and diameter were 60.45–61.52 and 14.10–15.01cm, respectively. In addition, *P. calleryana* tree height and trunk circumference were 5.11–5.35 and 25.27–23.30cm, also shoot length and diameter were 62.40–63.50 and 14.23–15.22cm, respectively.

These results were in agreement with those obtained by **El-Azzoani *et al.* (1960)** who found that *P. calleryana* has proved to be superior than *P. communis*. In addition, **Saied and El-Shall (1987)** revealed that vegetative growth of "Le Conte" pear significantly increased when betch rootstock was used followed by *P. calleryana*, WN and then *P. communis*. In addition, **Salem *et al.* (2010)** found that "Le Conte" cv. growth was more vigorous on betch and calleryana rootstocks than on *P. communis*. Moreover, **Lewko *et al.* (2006)** reported that vigorous of rootstocks was assessed by the rootstock and scion diameter, shoot length and shoot mass.

Table (1): Effect of four pear rootstocks on vegetative growth parameters of "Le Conte" cultivar during 2012 and 2013 seasons.

Rootstock	Growth parameters							
	Tree characters				Shoots (cm)			
	Tree height (m)		Trunk circumference (cm)		Length (cm)		Diameter (cm)	
	2012	2013	2012	2013	2012	2013	2012	2013
Pyrus betulafolia	5.32A	5.54A	28.09A	26.00A	60.45AB	61.52B	14.10A	15.01 A
Pyrus calleryana	5.11AB	5.35AB	25.27B	23.30B	62.40A	63.50A	14.23A	15.22A
Pyrus communis	4.40 C	4.23C	20.56C	18.78C	55.35C	55.00D	11.73 B	12.53 B
Winter Nelis	5.00 B	5.17B	24.74B	22.65B	58.20B	59.41C	13.40 A	14.25 A

Means having the same letters in each column are not significantly different at 0.05 level.

2- Flowering data:-

Number of spurs, number of flowers/spur and /shoot and date of full blooming were used to study the effect of different rootstocks on “Le Conte” pear cultivar (Table 2). Average number of spurs were the highest on *P. betulaefolia* (12.90–12.00), moderately on *P. communis* and *P. calleryana* (12.13–10.90 and 11.80–10.00) at both seasons, respectively and were less recording with Winter Nelis (10.40–6.50). While, average number of flowers/spur or /branch were greatest on *P. betulaefolia* (8.40–7.70 and 74.50–66.53), moderately on *P. communis* (7.80–6.60 and 70.80–64.58) and *on P. calleryana* (7.30-6.00 and 68.70-63.30) but were less on Winter Nelis (6.60–5.00 and 62.80– 56.80) at the first and second seasons, respectively. However, date of full blooming was earlier on *P. betulaefolia* and *P. calleryana*, (9–12 of March) and (10–11 of March) but was late on *P.communis* and Winter Nelis, (14–15 of March and 14–16 of March) at the first and second studied seasons, respectively.

Table (2): Effect of four pear rootstocks on flowering of "Le Conte" cultivarduring 2012 and 2013 seasons.

Rootstock	Flowering data							
	Spurs number		Flowers number /spur		Flowers number/ /branch		Date of full blooming	
	2012	2013	2012	2013	2012	2013	2012	2013
Pyrus betulafolia	12.90 A	12.00A	8.40A	7.70A	74.50A	66.53A	9March	12-Mar
Pyrus calleryana	11.80AB	10.00B	7.30BC	6.00B	68.70C	63.30B	11-Mar	10-Mar
Pyrus communis	12.13AB	10.90AB	7.80AB	6.60B	70.80B	64.58AB	14-Mar	15-Mar
Winter Nelis	10.40B	6.50C	6.60C	5.00C	62.80D	56.80C	14-Mar	16-Mar

Means having the same letters in each column are not significantly different at 0.05 level

These results were in harmony with those obtained by **Faust *et al.* (1976)** who found that *P. calleryana* is one of the earliest blooming and *P. communis* is one of the latest blooming species. **Saied and El-Shall (1987)** indicated that *P. calleryana* and *P. betulaefolia* hastened vegetative bud break of "Le Conte" cv. than Winter Nelis and *P. communis*. Also, **El-Shall *et al.* (1993)** worked on "Le Conte" pear on P. betulaefolia, P. calleryana, Winter Nelis and P. communis rootstocks, found that "Le Conte" on P. calleryana was the earliest in vegetative bud break and blooming, while communis was the latest.

3- Fruit set and yield: -

Data in Table (3) showed that *P. betulaefolia* significantly caused the highest fruit set percentage (18.7 and 15.4%) as well as the heaviest yield (27.3 and 28.0 kg/tree) through 2012 and 2013 seasons, respectively. However, P. communis followed *P. betulaefolia* in this respect. However, "Le Conte" pear cv. has the least fruit set and yield on P. calleryana rootstock.

Table (3): Effect of four pear rootstocks on fruit set, yield and fruit weight of "Le Conte" cultivar during 2012 and 2013 seasons.

Rootstock	Fruit set (%)		Yield (Kg/Tree)		Fruit weight (g)	
	2012	2013	2012	2013	2012	2013
Pyrus betulafolia	18.70A	15.40A	27.30A	28.00A	154.7B	175.3B
Pyrus calleryana	10.00C	08.10C	19.60C	17.83B	144.2C	162.5C
Pyrus communis	13.20B	12.20B	23.50B	26.63A	166.3A	190.1A
Winter Nelis	12.20B	11.80B	22.00BC	19.63B	150.5B	169.3B

Means having the same letters in each column are not significantly different at 0.05 level.

3- Physical Fruit characters: -

Physical and chemical pear fruit characters were examined through this study (Table 3 and 4). Data revealed that P. communis significantly induced the biggest fruit weight (166.3 and 190.1g), size (155.0 and 165cm^3) and fruit dimensions (length and diameter) as well as least fruit firmness (8.8 and 9.0 Ib/inch^2) at the first and second seasons, respectively. While, "Le Conte" cv. has the least fruit size and dimensions on Winter Nelis rootstock.

Moreover, "Le Conte" pear cv. has the highest fruit firmness (9.5 and 9.8 Ib/inch^2) on P. calleryana rootstock.

Table (4): Effect of four pear rootstocks on physical fruit characters of "Le Conte" cultivar during 2012 and 2013 seasons.

Rootstock	Physical fruit characters							
	Fruit size (cm^3)		Fruit length (cm)		Fruit diameter (cm)		Fruit firmness (Ib/inch^2)	
	2012	2013	2012	2013	2012	2013	2012	2013
Pyrus betulafolia	135.0B	150.0B	7.30B	7.20AB	6.40AB	6.30AB	9.20AB	9.50AB
Pyrus calleryana	115.0C	131.7C	7.20BC	7.00BC	6.20AB	5.90BC	9.50A	9.80A
Pyrus communis	155.0A	165.0A	7.83A	7.50A	6.70A	6.90A	8.80B	9.00B
Winter Nelis	100.0D	111.3D	6.90C	6.70C	6.00B	5.60C	9.00B	9.40AB

Means having the same letters in each column are not significantly different at 0.05 level.

The obtained data in this study was in conveyable with those obtained by **El-Shall *et al.* (1993)** who found that fruits of "Le Conte" pear budded on *P. communis* recorded the highest weight and dimensions of fruits; **Salem *et al.*, (2010)** who reported that "Le Conte" on *P. communis* gave the highest weight, volume and length & diameter followed by *P. calleryana* and betch. In addition, Winter Nelis fruit size is small; it may need thinning to produce good sized fruit **((Roper 2001).** Generally, the results of fruit firmness were in harmony with those noticed by **El-Shall *et al.* (1993)** who reported that fruit firmness in descending order was "Le Conte" on P. calleryana followed by betch, WN and on communis in the last.

Also, **Salem *et al.* (2010)** found that the highest value of fruit firmness was related to "Le Conte" on P. calleryana followed by on Betch while *P. communis* was the lowest firmness. Considerably, one of the mechanisms behind the influence of rootstock on scion vigour and yield is that its effects upon the scion by influencing the amounts of nutrient taken up and translated to the scion **Larsen and Higgins (1989)**. Also, **Fallahi and Larsen (1984)** reported that vigour of rootstock has significant impact on the scion nutrient status in apple. These data were supported by several investigators, **Larsen and Higgins (1989))** who found that annual yield of "Bartlett" pear was affected by rootstock. Moreover, the same investigators indicated that scion/rootstock interaction significantly influenced fruit production of 10 Asian pear cultivars. **El-Shall et al. (1993)** reported that the highest yield was found on trees grown on betch followed by communis, calleryana, Winter Nelis. In addition,

Salem et al. (2010) stated that the highest percentage of fruit set and yield (kg) was induced by "Le Conte" budded on betch followed by communis while the lowest values were related to the trees on *P. calleryana*.

4- Chemical Fruit characters: -

Data in Table (5) indicated that the highest TSS, TSS/acid ratio and the least acidity content were with trees on *P. communis* and Winter Nelis, where TSS was 13.90–13.70 and 13.10–12.70% and TSS/acid ratio was 30.35–26.88 and 25.21–21.21% but acidity was 0.46–0.51 and 0.52–0.60% at both seasons, respectively. On the contrary, TSS and TSS/acid ratio were less and acidity was high with *P. calleryana* and *P. betulaefolia*, where TSS was 11.30–11.73, 12.30 – 12.10% and TSS/acid ratio was 18.25–18.05, 21.62–19.56% but acidity was 0.62–0.65 and 0.57–0.62% at both seasons, respectively).

Table (5): Effect of four pear rootstocks on chemical fruit characters of "Le Conte" pear cultivar during 2012 and 2013 seasons.

Rootstock	Chemical fruit characters					
	TSS (%)		Acidity (%)		TSS/acid Ratio	
	2012	2013	2012	2013	2012	2013
Pyrus betulafolia	12.30C	12.10C	0.57AB	0.62A	21.62C	19.56BC
Pyrus calleryana	11.30D	11.73C	0.62A	0.65A	18.25D	18.05C
Pyrus communis	13.90A	13.70A	0.46C	0.51B	30.35A	26.88A
Winter Nelis	13.10B	12.70B	0.52B	0.60A	25.21B	21.21B

Means having the same letters in each column are not significantly different at 0.05 level.

These results were in line with those stated by **Kamboj and Quinlan (1997)** they indicated that rootstocks influence pear fruit quality. Also, **El-Shall *et al.* (1993)** recorded that fruits from trees on *P. communis* gave the highest TSS fruit content followed by trees on WN, betch, then calleryana which was the lowest content. Acid fruit content recorded the opposite trend, as trees on communis gave the lower content followed in increasing order by WN, betch, then calleryana which was the highest acid fruit content.

5- Severity of fire blight disease:-

Fire blight disease was calculated according to disease severity as percentage of infected spurs divided on total spurs number per tree of “Le Conte” cultivar budded on different pear rootstocks, under naturally infection conditions (Table 6). Data cleared that *P. calleryana* and *P. betulaefolia* expressed lower severity to the disease compared with other pear rootstocks, where disease severity was (38.3– 36.5 and 40.4–38.9%). While *P. communis* and Winter Nelis expressed higher severity to fire blight disease, where disease severity was (48.3–46.0 and 45.7–43.8%) at 2012 and 2013 seasons, respectively.

However, there was apositive relationship between horticultural characters and resistance or susceptible of pear tree to fire blight disease, where *P. calleryana* and *P. betulaefolia* rootstocks which less infection were early flowering (9–12 of March) and showed higher tree growth, also, appeared high fruit acidity, low content of TSS and TSS/acid ratio, While, *P.communis* and Winter Nelis rootstocks which recorded high infection percentage were late in flowering (14–16 of March) and the lowest in tree growth as well as low acidity and high TSS content and TSS/acid ratio.

These results were in harmony with many investigators as **Koski and Jacobi, (2013)** who revealed that, Winter Nelis rootstock is a high susceptible to fire blight. **Stebbins (1995)** reported that *P. calleryana* seedling is resistant to fire blight. In addition, *P. communis* is lack fire blight resistance and *P. betulaefolia* seedlings are not resistant to fire blight **(Westwood and Lombard, 1969)**. Although *P. calleryana* seedling is resistant to fire blight, it is unacceptable rootstock for pear in Egypt because it susceptible to lime-induced chlorosis. But *P. calleryana* is earlier in blooming, low chilling requirements and often is a good choice as a rootstock for any pear variety **(Stebbins, 1995).**

Table (6): Effect of four pear rootstocks on infection percentage (IP) of fire blight disease of "Le Conte" pear cultivar during 2012 and 2013 seasons.

Rootstock	Infection percentage (%)	
	2012	2013
Pyrus betulafolia	40.4A	38.9A
Pyrus calleryana	38.3A	36.5A
Pyrus communis	48.3B	46.0B
Winter Nelis	45.7AB	43.8AB

Means having the same letters in each column are not significantly different at 0.05 level.

CONCLUSION

From the above results, it could be concluded that, *P. betulaefolia* and *P. calleryana* were the more fire blight disease resistant rootstocks, as they vigour in growth and early in the flowering. Overall, *P. betulaefolia rootstock is preferred than P. calleryana* because the last is susceptible to lime-induced chlorosis.

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تأثير بعض أصول الكمثرى على النمو والإثمار ومفاومة مرض اللفحة النارية لصنف الكمثرى "ليكونت".

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أجريت تلك الدراسة خلال موسمى ٢٠١٢، ٢٠١٣ فى محطة بحوث البساتين بالقناطر الخيرية بمحافظة القليوبية، مصر على صنف الكمثرى "ليكونت" المطعوم على أربعة أصول مختلفة من الكمثرى (ونتر نيلس، بتشيليفوليا، كالريانا، كميونس) لدراسة تأثير هذه الأصول على الصفات البستانية و مدى الإصابة بمرض اللفحة النارية فى صنف الكمثرى الليكونت.

وأظهرت النتائج أن قياسات النمو للجذع أو الفرع للصنف :ليكونت" كانت أقل قيما مع أصول "الكميونس" و "ونتر نيلس"، بينما كانت أكثر قيما على أصلى "بتشيليفوليا" و"كالريانا" وكذلك وجد أن متوسط عدد الدوابر ومتوسط عدد الأزهار/الدابرة أو على الفرع كانت أعلى على أصل "بتشيليفوليا" ومتوسطة على أصلى "كلاريانا"، "كميونس" و أقل على "ونتر نيلس". كما أظهرت النتائج أن أصلى "بتشيليفوليا" و "كلاريانا" كانتا مبكرتا التزهير مما انعكس على الإثمار، فى حين أن أصلى "كميونس" و"ونترنيلس" كانتا متأخرتا التزهير. أكدت النتائج أن للصنف :ليكونت" على أصلى "بتشيليفوليا" و "كميونس" كان أعلى إنتاجية عنه على أصلى"كالريانا"و"ونترنيلس".

بالنسبة للصفات الكيميائية للثمار وجد أن محتوى الثمار من السكريات الكلية الذائبة والنسبة بينها كانت مرتفعة بينما كانت الحموضة منخفضة فى ثمار "الليكونت" على الأصلين "كميونسن" و "ونتر نيلس" والعكس صحيح تماما على الأصلين "بتشيليفوليا" و "كالريانا".

وأظهرت نتائج المقاومة لمرض اللفحة النارية تحت ظروف الإصابة الطبيعية أن أصول "كالريانا" و "بتشيليفوليا" كانتا أكثر مقاومة للمرض عن أصلى "كميونس" و"ونتر نيلس" كانت أكثر إصابة بالمرض.

ومن النتائج السابقة أتضح أنه توجد علاقة موجبة بين الصفات البستانية و شدة الإصابة بمرض اللفحة النارية تحت الظروف المصرية حيث لوحظ أن الأصول ذات صفة المقاومة للمرض (كالريانا و بتشيليفوليا) كانتا مبكرة التزهير والأشجار قوية النمو وعصير الثمار يحتوى غلى سكريات كلية ذائبة منخفضة وحموضة مرتفعة بينما الأصول ذات صفة القابلية للإصابة بالمرض (كميونس وونتر نيلس) كانت متأخرة التزهير والأشجار ذات نمو أقل وعصير الثمار يحتوى على حموضة أقل و سكريات كلية ذائبة مرتفعة.

و من النتائج السابقة يتضح أن أصلى بتشيليفوليا، كلاريانا هما أكثر الأصول الأربعة مقازمة للإصابة باللفحة النارية وذلك نظرا لقوة نموهما و تبكيرهما فى التزهير. و يفضل أصل البتشيليفوليا لصنف "الليكونت" عن الكلاريانا لسهولة إصابة الأخير بمرض الإصفرار.