FIRE BLIGHT OF PEAR IN EGYPT: CHRONOLOGICAL BACKGROUND AND NEW FINDINGS

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(Manuscript received 26 August 2018)

Abstract

The pear disorder described as fire blight has long been disputed in Egypt due to relatively dry climate unfavorable for the disease epidemic. Efforts were carried out in the present work to clarify the cause of confusion and to elucidate some aspects of such discrepancies. Orchards inspections in El-Behera governorate revealed obvious scorching on foliage of some trees, without noticeable seeping under many circumstances. The syndrome disputed plant pathologists in many institutions, because of the validated absence of such scorching on apple trees raised in the same pear orchard. Samples collected from different pear organs of sporadically affected trees, were subject to isolate the pathogen on either high sucrose or Miller- Schroth (MS), media selective for *Erwinia amylovora*. Macroscopic, microscopic, biochemical and molecular determinations revealed no obvious variation among isolates recovered from different pear tree organs. The obtained results indicated that, the isolated bacteria belonged to *Erwinia amylovora*. Isolates from cankerous branches, however, were more pathogenic compared to those recovered from other plant organs. The rootstocks dominating in Egypt are *P.communis*, *P.betulaefolia* and *P.calleryana*. The effect of such rootstocks on" MKM" grafted pear cultivar was compared. The differences in the blooming date and variation in the occurrence and severity of such a disorder was evaluated. The earlier blooming, as shown influenced by the rootstock effect, the lower the disease expression. *P.calleryana* and *P.betulaefolia* showed full blooming in the third week of March, and escaped severe infection. The remarkable late onset of flowering of *P.communis* grafted trees commencing at the end of March, resulted in greater disease complications, due to the possible discharge of bacteria from holdover cankers, coinciding with more favorable temperature and higher insect activity. The influence of different rootstocks on growth habits of pear grafts and their respective influence on the disorders in concern must be fully investigated. The occurrence of associated microscopic mites must be seriously considered, which may be contributing to the reported discrepancy among scientists and the contradictory remarks on fire blight epidemics in Egypt.

Key words: *Erwinia amylovora* , *P.communis*, *P.betulaefolia* *P.calleryana* , different rootstocks, pear organs and eriophyde mites .

INTRODUCTION

The disease of fire blight was first mentioned in Egypt in 1962 (El-Helaly *et al*. 1964) then many scientists reported spreading of the disease in some governorates (Tawfik *et al*., 2006; and Shoeib *et al*.,2017). Early in April 1982 and 1983 symptoms similar to fire blight, blossom and twig blast of pear have ravaged orchards at certain districts in northern Egypt. The conditions necessary for fire blight outbreaks, especially rains, are not prevailing for the disease epidemic though the record made by El-Helaly *et al*. (1964). It is worth noting, however, that such record was made many years ahead of Germany with extremely favourable climatological conditions for outbreaks (Van der Zwet and Keil, 1979). That record has contradicted the basic principles of fire blight epidemics in general and caused a lot of confusions in particular.

Monitoring affected orchards at different governorates in Egypt revealed inconsistent occurrence of scorching in juvenile parts of the tree but lacking distinct ooze droplets of bacteria, characterizing fire blight. Sporadic cankerous pear trees adjacent side by side to young apple trees in the same orchards were found free from any disorder (Farag *et al*., 1986). Similar observations were reported by Paulus(1983) and Van der Zwet (1983). The absence of ooze in cankerous branches and trunks was also reported by El-Goorani (1973) and Paulus(1983). In literature, the bacterial ooze on blasted pear buds is associated with *Erwinia amylovora* and absence of ooze has been one of the features differentiating *Pseudomonas syringae* infection. However, production of ooze by an unidentified species of *Pseudomonas* on Magness pear blossoms and buds was reported by Van der Zwet and Keil (1979). Another species was described in Russia as *P.syringae*, causing a disease which differed from fire blight and blast in that the bark cracks and peels off, with no infection on unripe fruits.

Blossom blight phase of fire blight is crucial in rosaceous plant, namely apple and pear trees. Control trials with chemicals in Egypt over the last three decades did not overcome the problem, though worldwide reports concluded that copper fungicides can suppress the disease (Paulin and Lachuad, 1984). Different brands of agrostreptomycin did not show any noticeable control in Egypt and sporadic annual increasing syndromes are still occurring. Spraying dithiocarbamic acid fungicide derivatives, namely mancozeb, gave promising control on yearly application. Freedom of fungal infection in affected samples was almost common (Farag, unpublished Data).

The brief account outlined above, revealed the necessity of studying the existing dilemma from another view point.

The objective of this work was to define some factors contributing to the problem, which started in 1964 and exaggerated in1983, as fire blight. The effect of pear rootstocks on the date of blooming in relation to the disorder the involvement of bark borers and eriophyde mites were considered.

MATERIALS AND METHODS

1- **Pear orchards and sampling:**

Four pear orchards at Kafr El-Dawar, El-Behera governorate, were subjected to seasonal examination for two years starting 2015. Observations on orchard condition were recorded with special emphasis on the age of the trees and the root-stock used and certain growth parameters.

Reasonable samples of blighted blossoms, leaves, and thin sections of cankerous branches were collected for laboratory examination and isolation. Surface sterilization was avoided because of the tenderness of samples and highly selective media for isolation of *Erwinia amylovora* were used. Miller-Schroth (MS) medium (Miller and Schroth, 1972) and high sucrose medium (Cross and Goodman, 1973) were principally used for isolation. Single colonies were selected and propagated on King's B slants. Bacterial stock suspension in sterilized tap water was kept during the course of the study.

2- Pathogenic potential of isolates:

Bacteria recovered from stems, shoots, leaves, blossoms and fruits sample were tested for pathogenicity on green immature pear fruitlets. Immature pear fruitlets were punctured with a sterile needle laden with the bacteria isolated from different pear organs.

Five replicate fruitlets were considered for each isolate along with control treatment (sterile water). Re-isolation was also made from inoculated fruitlets on King's B medium.

Pathogenic potential of isolates on inoculated fruitlets was determined based on the extent of necrotic lesion, or the diameter of greasing area and oozing according to Westwood (1978) scale as follows:

0	=	no necrosis and no oozing
1	=	slight necrosis and oozing
2	=	moderate necrosis and oozing
3	=	big necrosis and oozing
4	=	extraordinary necrosis and oozing
5	=	blackening necrosis and oozing

$$\text{Pathogenic potential} = \frac{\Sigma(\text{Class X No. of fruits in class}) \times 100}{\text{Total No. of fruits} \times 5}$$

3- Disease assessment:

On farm determination of the disease spread was made by the end of April in the years of experimentation. The number of diseased clusters along four branches / tree was enumerated. The total number of affected clusters was counted in five labeled trees and rationed to the total number of clusters.

4- Identification of the pathogen:

Pathogenic isolates were bacteriologically identified according to Krieg *et al*. (1994). Phenotypic characteristics of colonies and other microscopic examination were described.

5- Polymerase chain reaction (PCR):

Confirmative identification of isolated bacteria was made with PCR and affiliation technique. The isolates were grown in 10 ml of nutrient broth for 48 hours, centrifuged, resuspended, diluted in water and added to the reaction mixture (described below). For DNA extraction, the bacteria were lysed by lysozyme and sodium dodecyl sulfate, and the liberated nucleic acids were purified by repeated extraction with phenol and then with chloroform-isoamyl alcohol. Five micro liters of the diluted DNA preparation was used for the PCR protocol suggested by Bereswill *et al*. (1992).

Two oligonucleotide primers from the borders of the pEA29 fragment with the sequences of:

5'-CGG 'TTT TT'A ACG CTG GG for primer A

5'-GGG CAA ATA CTC GGA TT for primer B

were used as described by Bereswill *et al*. (1992). PCR amplification was carried out in a total volume of 50 µl with the following composition:

	Working concentration	Volume per reaction (µl)	Final concentration
Molecular – grade water		34.80	
PCR buffer	10x	5.00	1x
MgCl2	50mM	3.00	3Mm
dNTPs	10mM	1.00	0.2mM of each dNTPs
Primer A	10 µM	0.5	0.1 Mm
Primer B	10 µM	0.5	0.1 Mm
Taq polymerase	5U µL-1	0.2	1u
Subtotal		45.00	
DNA		5.00	
Total reaction volume of a single PCR reaction		50.00	

PCR cycling programme was run in the following sequence:

5 min at 93°C,40 cycles of 30 s at 93°C, 30 s at 52°C and 1 min 5s at 72°C and a final step of 10 min at 72°C.The PCR products were separated on a 1.5% agarose gel (1.5 to 2 h at 100 V), stained with ethidium bromide (0.5% μgL^{-1}), and visualized with ultraviolet light.

6- Growth variables of pear trees:

Observations were made in four selected orchards in 2015and 2016. Selection of orchards was made according to the age (8-10 years old) and root-stocks used. The dominant root stocks were *Pyrus communis*, *P. betulaefolia* and *P.calleryana* grafted with "MKM" scion cultivar were considered. Five trees in each orchard of approximately equal size were marked and weekly visited starting at the time of blooming onset for one month. Complete flowering were carefully determined as well as the date of apparent fruit setting to compare the effect of different root- stocks on such characters.

7- Statistical analyses:

Statistical analyses were preformed and also date of pear blooming was made. The effect of pear rootstocks on fire blight sporadic infection was compared according to Duncan (1955).

The *Post – hoc* (LSD 0.05) using SPSS 17 was used to determine the difference in pathogenic potential of isolates recovered from different pear organs.

RESULTS

1. Preliminary identification:

No variation in morphological, physiological and biochemical characteristics could be recognized in the most pathogenic isolate in each group in concern subject to tentative identification.

All isolates were short - rods, non spore former, gram negative, motile rods. All isolates were able to utilize L (+) arabinose, fructose, galactose, trehalose, mannitol glucose and sorbitol as carbon source. Meanwhile, these isolates were not able to utilize D (-) arabinose, cellobiose, lactose, maltose, mannose, xylose as carbon source. Other characteristics are shown in Tables (1) and (2).

Table 1. Utilization of different carbohydrate by isolated bacteria from different pear organs.

Compound	Isolate source				
	Stem	Shoot	Leaf	Blossom	Fruit
L (+) arabinose	+	+	+	+	+
D (-) arabinose	-	-	-	-	-
Cellobiose	-	-	-	-	-
Fructose	++	++	++	++	++
Galactose	++	++	++	++	++
Glucose	++	++	++	++	++
Lactose	-	-	-	-	-
Maltose	-	-	-	-	-
Mannose	-	-	-	-	-
Sucrose	++	++	++	++	++
Xylose	-	-	-	-	-
Mannitol	++	++	++	++	++
Sorbitol	++	++	++	++	++
Salicin	-	-	-	-	-

* The reaction determined after 7 days of incubation

\- Negative reaction + Moderate acidity ++ High acidity

Table 2. Biochemical and physiological characteristics of isolated bacteria from different pear organs.

Test	Isolate source				
	Stem	Shoot	Leaf	Blossom	Fruit
KOH 3%	+	+	+	+	+
Catalase	+	+	+	+	+
Oxidase	-	-	-	-	-
Urease production	-	-	-	-	-
Starch hydrolysis	-	-	-	-	-
Gelatin liquefaction	+	+	+	+	+
Voges-Proskauer (VP)	+	+	+	+	+
Methyl red (MR)	-	-	-	-	-
Levan production	+	+	+	+	+
Nitrate reduction	-	-	-	-	-
Reducing substance from sucrose	+	+	+	+	+
H_2S from cysteine	-	-	-	-	-
Fluorescent pigment *	-	-	-	-	-
Pink pigment**	-	-	-	-	-

* On King's B medium (KB)
** On yeast extract-dextrose – CaCO3 (YDC) medium.
+ Positive reaction
- Negative reaction

Results reported in tables (1) and (2) indicated that the bacterial isolates recovered from different pear organs under study could be placed under *Erwinia amylovora* the causal of fire blight disease.

2. Polymerase chain reaction (PCR) study:

Polymerase Chain Reaction (PCR) was employed for further confirmation of identity of isolates as *Erwinia amylovora*. Universal primers A and B used in tested isolates to identify pE29 plasmid of *Erwinia amylovora* reacted positively and produced the expected 900 bp product shown in Figure (1). The results agree with those obtained by other investigators. On the other hand, the results showed equal signal at 900bp for all isolates that indicate no variation between isolates obtained from different plant organs could be detected in PCR test.

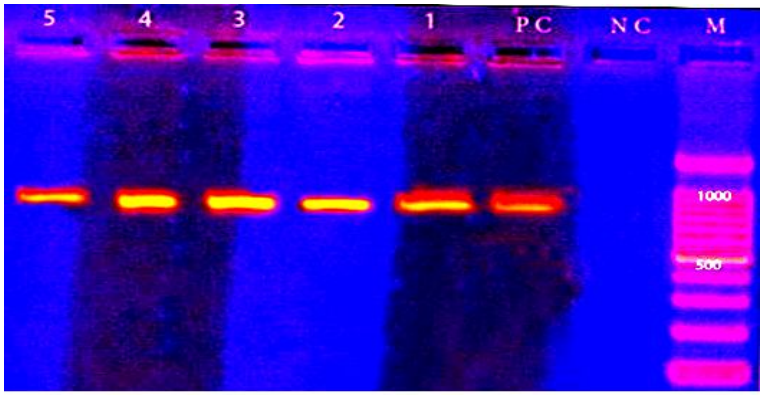

Fig., 1. Lanes 1:5, PCR product of (5) isolates of *E. amylovora* isolated from different pear organs using two oligonucleotide primers from the borders of the pEA29 fragment, 900-bp amplicon from *E. amylovora* M, molecular size marker (100-bp DNA ladder; size(base pair)

Lane N.C, PCR negative control, Lane P.C, PCR positive control

3. Pathogenicity and pathogenic potentials of isolates:

Bacterial isolates propagated on King's B medium for 3 days at 28 °C were tested.

Results in table (3) showed that isolates from different sources were pathogenic. The most aggressive isolates, under the conditions of the experiment, were those isolated from stem holdover cankers and shoot cankers. Weak virulence was recognized for those recovered from leaves and fruits. Moderate severity, however, was shown for isolates recovered from blossom.

It is important to note that regardless of varied severity, as expressed by oozing from the site of inoculation the infection was started with greasing around the fruit puncture. The greater the diameter of greased area the greater the pathogenic potential could be recognized. Prolonged incubation of inoculated fruitlets resulted in relatively variable degrees of fruit blackening and shrinkage (fig., 2).

Table 3. Variation in pathogenic potential of isolates recovered from different pear organs

Origin of isolate	% of fruitlets infection	% of oozing	Severity of infection (Mean ± standard error)
Stem cankers	100	80	$88^{1} \pm 4.9$
Limb cankers	100	80	$84^{2} \pm 4.0$
Leave stalks	100	40	$64^{3} \pm 9.8$
Blossoms	100	60	$72^{4} \pm 4.9$
Fruits	100	20	$52^{5} \pm 4.9$

LSD= 0.05

Values are Means ± SE,[1,3] $P = 0.01$,[1,4] $P = 0.08$,[1,5] $p < 0.001$,[2,3] $P = 0.03$,[2,5] $P = 0.001$, [4,5] $P=0.03$

Mean of (5) replicates

Fig. 2. Immature pear fruitlets showing blackened area with droplet of bacterial ooze after inoculation with *E. amylovora* and immature pear fruitlet inoculated by sterile distilled water as a negative control (for left).

4. Fire blight in orchard grown pears:

The four orchards selected in Behera governorate representing different pear rootstocks were examined in the fruiting seasons 2015 and 2016. Data presented in Table (4) showed that the sporadic occurrence of fire blight, at the orchard level, varied with the rootstock grafted. However, the disease incidence in the year 2015 was slightly higher than that recorded in 2016. The root stocks generally used in the four orchards, displayed significant differences in the percentage of infection being higher for *P.communis.* However, *P.betulaefolia* and *P.calleryana* were significantly more tolerant to the disease without any statistical differences between them. The data presented in Table (4) are the percentages of damaged spurs per tree. The percentage of affected trees was neglected because of the rarity of the event on both *P.betulaefolia* and *P.calleryana*.

Table 4. Effect of pear rootstocks on fire blight infection during 2015 and 2016.

Rootstock	(natural pear rootstock) infection %	
	Season 2015*	Season 2016*
P. communis	37.0[b]	35.0[b]
P.betulaefolia	22.3[a]	22.0[a]
P.calleryana	23.0[a]	22.3a

*means of four orchards

Means having the same letter at the same column are not significantly different ($p < 0.05$).

5. Date of flowering in relation disease incidence:

Data in Table (5) showed that, rootstocks varied as to the date of blooming in the years of study. The late blooming with *P. communis* rootstock was commenced on 20th and 23th of March in 2015 and 2016, respectively. The

corresponding blooming dates for *P.calleryana* in 2015 and 2016 were 17th and 10th of March as well for *P.betulaefolia*. Such slight differences in blooming onset may not explain the differences in severity percent. The completed full blooming may explain differences expressed by severity.

It is worth noting, however, that a complete fruit set was recognized by mid April, 2015 though sporadic spared inflorescence was noticed, for *P.calleryana* and *P.betulaefolia*. Meanwhile, blooming was continuously active in *P. communis* with low fruit setting, reaching full fruit setting by April 30th.

No significant differences were noticed in disease severity with *P.calleryana* and *P.betulaefolia* rootstocks in both seasons; however, significantly higher severities were experienced with *P. communis* rootstocks.

Table 5. Date of blooming of pears on different rootstocks and severity of fire blight.

Rootstock	Flowering		Full fruit set		Severity%	
	2015	2016	2015	2016	2015	2016
*P.betulaefolia**	17th mar.	18th mar.	15th ap.	17th ap.	26.3[a]	28.0[a]
*P.calleryana**	17th mar.	10th mar.	15th ap.	12th ap.	23.0[a]	26.3[a]
*P. communis***	20th mar.	23th mar.	30th ap.	30th ap.	37.0[b]	35.0[b]

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

*Sporadic late inflorescence ** Continued blooming

DISCUSSION

Fire blight dilemma has long been disputed in Egypt since the first description made by El – Helaly *et al*. (1964). The conditions necessary for fire blight outbreaks, are not prevailing in Egypt and such an early record has been made many years ahead of Germany with better climatological conditions for disease predisposition.

From the bacteriological point of view, the early description of the so called "Egyptian isolates" of *E. amylovora* made by EL-Helaly *et al*. (1964) was skeptic and erratic to a large extent. They found that their isolates utilized glucose with acid production but not dextrose. Such specificity for different synonyms of the same substance is not known for *E. amylovora*. Moreover, they found that 5% sucrose with gelatin medium decreased the time of liquefaction from 15 to 4 days, which is contrary to what is known about protein sparing action of carbohydrate. Such discrepancies in the identification of the so called "Egyptian isolates of *E. amylovora*" along with the limited occurrence of diagnostic symptoms are looked upon with great concern. However, Abo EL-Dahab *et al*. (1983) reported on "Severe outbreaks of fire blight in Egypt during 1982-1983" and referred to the previous record of EL-Helaly *et*

al. (1964). Meanwhile, EL-Goorani (1973) failed to isolate any pathogenic bacteria during a monitoring study extending over six years period.

Monitoring affected orchards in previous preliminary study at different governorates revealed inconsistent spread of scorching of juvenile parts of the tree resembling those of fire blight syndrome but lacking bacterial ooze droplets which is very characteristic of the disease. Sporadic and very few trees at orchard level were seen with dry marks of sap around the holdover cankers, in neglected uncarefully managed orchards. Apple trees raised in the same pear orchards near Alexandria did not show neither scorching nor ooze. Insecticides of certain groups especially those containing sulphur derivatives showed distinctly notable management effect in the subsequent years. Some growers, however, cleared their orchards and tried other crops, under the notion of fire blight.

The brief account outlined above reveals the necessity of managing the problem through considering other possible factors. Thus, the effect of pear root stocks dominating in Egypt on the suspected syndrome occurrence was postulated. Monitoring of previously listed affected orchards was considered and four of them with different root-stocks were selected.

Isolation of bacteria was made at pear blooming period on selective media and tested for pathogenicity in pear fruitlets and pathogenic potential of isolates from different organs was compared. Hold-over cankers were the most important source of primary inoculum for blossom infection in the spring as evidenced by the higher severity of infection (Beer and Norelli, 1977). The least severity was found for fruit isolates. The variation in severity or aggressiveness of pathogenic bacteria from different sources was previously noted in *Ralstonia solanacearum* (Balabel *et al*., 2005).

Identification of recovered bacteria was made according to Krieg *et al*. (1994) and further confirmed by PCR for five selected isolates using specific primers. Many phytopathogenic bacteria carry plasmids. However, in the case of *Erwinia amylovora*, a low copy number plasmid pE 29 has been shown in all isolates studied and responsible for modulates development of fire blight symptoms. This plasmid seems to play an important role in pathogenicity (Falkenstein, 1989). The presence of this plasmid in all isolates allowed primers specific to a DNA fragment of pE 29 for detection of *Erwinia amylovora* by PCR to be proposed (Bereswill *et al*., 1992) which were used in this study. All tests carried out revealed affiliation of all isolatcs shedied to *E. amylovora*

In the present study, the influence of pear rootstocks on scion development was correlated with disease incidence. *Pyrus betulaefolia* grafted with "MKM" cultivar scion

was more resistant to infection compared to other rootstocks. The rootstocks of *P.callaryana* ,however, is not appreciated in Egypt because of certain physiological disorders as lime induced chlorosis, regardless of the early blooming and low chilling requirements favorable for escaping the disease. In conclusion, the pear cultivars are known to vary greatly in their reaction to *E.amylovora* (Koski and Jacobi, 2013) and may complicate fire blight studies.

The rootstocks and their influence on the liability to infection with *E.amylovora* was justified in this work by the finding that late blooming of MKM-grafted *P.communis* coincided with greater infection, through florets and intense visits of pollinating insects because of warm temperatures in this period (Said and el- shall 1987). It is worth noting, however, that *P.communis* is the principal rootstock dominating in Egyptian orchards that might be the biggest contributor to such crucial discrepancy in and contradictory remarks on such dilemma. The warm conditions in April favor greater physiological activity of pear trees and greater flow of sap, along with possible bacterial discharge from holdover cankers. In this regard, Van der Zwet (1983) reported one Alexandrine pear tree showed remnant streaks along the bark surface that were attributed to bacterial ooze early in spring. In the same orchard he found few younger apple trees free from either blast or blight symptoms. Moreover, he added that such remnants streaks may be attributed to the limb borer insect *Zeuzera pyrena*, a major problem of pome trees in Egypt. The absence of ooze on cankerous branches and stems was also reported by EL-Goorani (1973) and Paulus (1983).

In the present work, however, only sporadic suspected trees with symptoms could be recognized in the orchards under investigation, and no outbreaks could be documented. Some investigators reported that, water plays an important role in the spread of fire blight. Rain disseminates primary inoculum within orchards from overwintering cankers to blossoms and young vegetative shoots (Van der Zwet, 1994). Therefore, the dry conditions and lack of rains at the time of blooming might be among the reasons for the absence of outbreaks in Egypt. Therefore, the conditions necessary for disease inception and expression and those required for an outbreak must not be confused. The pathogen is disseminated by insects, rain, wind or wind-driven rain to open blossoms, shoot and leaves, where infection may occur. The effect of rootstocks on plant characteristics in general and susceptibility to fire blight must be seriously considered, in a joint work between horticulturists and plant pathologists at the cellular and biochemical levels.

The aforementioned findings and previous observations did not explain the freedom of Apple trees in Egypt from such confusing syndromes, though planted in

situ the same orchard. Historically, Apple is known as original host for fire blight outbreaks.

Accidentally, during microscopic lab examination of collected samples, the leaf petioles showed microscopic mites (40x). The occurrence of such individuals and their stages in almost all the samples examined may explain the discrepancies in finding of different investigators, and may provide a partial solution if deat with seriously.

In retrospect, the pear dilemma in Egypt could not be regarded as fire blight outbreaks. The pathogen *E. amylovora* definitely exists and may have been introduced to Egypt with imported rootstock seedlings as an inconspicuous latent infections, or through any other possible means (Van der Zwet and Beer, 1995) who reported that, rootstocks is an important phase of fire blight, however, they can play a substantial role in fire blight epidemiology (Deckers and schoofs, 2008).

Paulus (1983) found no evidence of fire blight in Egypt on mature trees and reported many causes contributing to the decline and the possibility of fire-blight must be seriously investigated. Van der Zwet (1983) attributed the decline to fire-blight, blast and severe insect damage. Farag *et al*. (1986) highlighted the pear disorder in Egypt and concluded the involvement of some insect borers along with a Pseudomonas strain that can infect *Phaseolus vulgaris*. El-Goorani (1973) after many years of the first record made in 1964 reported the failure to isolate any pathogenic bacteria during a monitoring study extending over a six -years period. Farag (1993) reported a lot of pitfalls in fire blight diagnosis made in both Egypt and abroad.

Finally, it is worth noting to emphasize that different control measures and spraying antibiotics did not show any promising effect. However, dithiocarbamates fungicides as Mancozeb gave very promising control after limited application at the time of blooming (Farag unpublished data). Intensive acarological studies must be seriously considered. A declaration of Egypt's freedom from fire blight epidemics became an urgent need. Emphasis on occurrence of sporadic and very limited cases of blighted trees should be made to eliminate confusion with exact meaning of outbreaks that requires specific conditions namely rains, temperature and those for pathogenesis. It is very important to differentiate between conditions necessary for disease inception and those necessary for outbreaks. Further investigations are definitely recommended, to help and define an integrated program dealing with the disorder and to avoid any further confusion as well as reach an unequivocal conclusion with respect to the real status of fire blight outbreaks in Egypt., where conducive environmental conditions are Mostly absent.

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اللفحة النارية بالكمثرى في مصر: خلفية زمنية ونتائج جديدة

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كانت اصابة الكمثرى بمرض اللفحة النارية فى مصر محل نقاش وجدال لفترة طويلة وهذا بسبب عدم مواءمة المناخ الجاف لوبائية هذا المرض . أجرى هذا العمل كمحاولة لتوضيح سبب هذا الارتباك وتفسيرا لبعض جوانب هذه التناقضات.

كشف التفتيش الحقلى في البساتين عن وجود حروق واضحة على أوراق بعض الاشجار ، دون انتشارلهذه الظاهرة في كثير من الظروف. أختلف علماء أمراض النبات في العديد من المعاهد البحثية على الأعراض المسببة لمرض اللفحة النارية ، حيث أن البستان الذى به آعراض مرضية على أشجار الكمثرى لا يوجد به أى آعراض مرضية على أشجار التفاح . أخذت العينات من الاجزاء النباتية لأشجار الكمثرى التى بها آعراض ظاهرية للمرض، تم عزل المسبب المرضى بأستخدام بيئة تحتوى على نسبه عاليه من السكروز أو بيئة متخصصة فى عزل بكتيريا ال *Erwinia amylovora* وهى بيئة Miller- Schroth (MS). لم تكشف الاختبارات الميكروسكوبية والبيوكيميائية والجزيئية عن وجود أي تباين واضح بين العزلات المعزولة من الأجزاء النباتية المختلفة لأشجار الكمثرى المصابة . أشارت النتائج المتحصل عليها أن جميع العزلات البكتيرية تنتمي إلى بكتيريا ال *Erwinia amylovora*، الا أنها أختلفت فيما بينها فى قدرتها المرضية حيث كانت العزلات المعزولة من جذوع الأشجار أكثرحدة مرضية من العزلات المعزولة من الأجزاء النباتية الأخرى. تمت مقارنة تأثير اصول الكمثري الاكثر شيوعا في مصر وهي *P.communis* و *P.betulaefolia* و *P.calleryana*. على صنف الكمثرى"MKM" (صنف مستحدث فى معهد بحوث البساتين – مركز البحوث الزراعية). تم تقييم الاختلافات فيما بينهم في تاريخ التزهير والشدة المرضية للاصابة . ادى الازهار المبكر الى أنخفاض الحدة المرضية. أظهر كل من الاصل *P.calleryana*– *P.betulaefolia* التزهير الكامل في الأسبوع الثالث من شهر مارس ، مما ادى الى قلة حدوث الاصابة. ادى التأخر الملحوظ في عملية التزهير للاصل *P.communis* لنهاية شهر مارس إلى زيادة شدة الحدة المرضية ، وزيادة أعداد البكتيريا نظرا لتوافر درجة الحرارة الملائمة وزيادة نشاط الحشرات.

أوضحت النتائج أهمية الدراسة الجيدة لتأثير اصول الكمثرى على احداثها للمرض . كذلك ظهور الاكاروسات مع بعض عينات الكمثرى التى بها آعراض مشابهة للفحة النارية يجب ان ننظر اليها بجدية لمعرفة الدور الذى تلعبه هذه الأفه، مما قد يساهم في تفسير سبب التباين والملاحظات المتناقضة بين العلماء حول وبائية مرض اللفحة النارية في مصر.