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Inventory and world geographical distribution of the olive tree (*Olea europaea* L.) diseases caused by viruses, bacteria and phytoplasma

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***Abstract*—** *The objective of this work is to prepare an Inventory about the viral and bacterial diseases of the olive tree (Olea europaea L.) and to study their Geographical distribution in the world. Fifteen viruses were considered as pathogens on the olive tree, these viruses were reported in 22 countries in five continents showing different symptoms on different olive tree varieties. All viruses were reported in Italy, some of these viruses were found only in the Eurepean continent, such as Olive vein yellows associated virus (OVYaV), Olive yellow mottling and decline associated virus (OYMDaV), Olive mild mosaic virus (OMMV) and Olive semilatent virus (OSLV). Two bacteria were reported as pathogen on the olive tree; Pseudomonas savastanoi. pv. savastanoi responsible bacteria of thr olive knot; a serious disease of olive (Olea europaea L.) in the Mediterranean region. This bacteria was detected in 22 countries in five continents, the majority of these countries exist in the Mediterranean Basin. Another bacteria was Xylella fastidiosa responsible of the quick decline syndrome of olive (OQDS), was deteted in Europe in four countries (Italy, Spain, Portugal and Slovenia) and in America in three countries (USA, Argentina and Brazil). Phtoplasmas was reported in 5 countries in three continents (Europe, Asia and Australia).*

***Keywords*— viruses, bacteria, phytoplasma, olive tree.**

I. INTRODUCTION

Oleaceae family or the family of dicotyledons includes 30 genera (Grohmann, 1981; Cronquist, 1981) of deciduous trees and shrubs including olive tree and its relatives numbering about 600 species (Bianco, 1990). The family is divided into several tribes, that is, Fontanesieae, Forsythieae, Jasmineae, Myxopyreae, and Oleeae (USDA, 2003; Bartolini and Petruccelli, 2002). These are mostly native of all continents except the Antarctic, including tropical, subtropical, and temperate regions of the world (Grohmann, 1981; Wallander and Albert, 2000). Oleaceae is best grown in Asia and Malaysia especially tropical and temperate regions of Asia (Perez *et al*., 2005). The genus Olea got its name from the Greek "elaia" and the Latin "oleum," but it is known by nearly 80 different names (Medai *et al*., 2001). The *Olea* genus comprises 30 species (Bracci *et al.,* 2011) but *Olea europaea* L. is the most popular member of the *Olea* genus (Kaniewski *et al*., 2012). It is the only species of this genus which is used as food (Sarwar, 2013) and is found in the Mediterranean region (Zohary *et al*., 2012).

The Olive is an important crop in terms of both its commercial value and the role it plays in the rural economy of the Mediterranean region, with its millions of producers (Gonzalez-Andujar, 2009). Olive tree and its fruit are also important in context of religion. Olives are narrated several times in the Bible, both in the New and Old Testaments (Ryan and Robard, 1998). Olive has also been praised as a blessed tree and fruit in the Holy Quran (Quran, Chapter 24 Al-Noor, Verse 35). Olives are not used as a natural fruit because of their extremely bitter taste but are rather consumed either as olive oil or table olives (Kanakis *et al*., 2013). Olive oil market is very significant in the olive industry as approximately 90% of annually produced olives go for oil processing (Sibbett *et al.,* 2005).

The olive tree is one of the oldest cultivated trees on the planet earth (Liphschitz *et al.,* 1991). The cultivation of olive started in ancient times and it dates back more than 7000 years. According to archaeological reports olives were cultivated for commercial purposes in Crete in 3000 BC by the Minoan civilization. The use of olive oil for body health can be found in ancient Greek literature (Gooch, 2005).

The therapeutic utilities of *O. europaea* have been indicated in traditional medicine. It has been known to reduce blood sugar, cholesterol, and uric acid. It has also been used to treat diabetes, hypertension, inflammation, diarrhea, respiratory and urinary tract infections, stomach

and intestinal diseases, asthma, hemorrhoids, rheumatism, laxative, mouth cleanser, and as a vasodilator (Hashmi *et al*., 2015).

Unfortunately, olive is subjected to be attacked with a variety of pathogens, which affect its health, yield and its oil quality (Sergeeva *et al*., 2005; Sanei *et al.,* 2004). Several biotic and abiotic factors affect olive tree consequently reducing the tree health and vigour, crop yield and quality of the extracted oil (Sanei *et al.,* 2012; Rhouma *et al.,* 2010; Palumbo *et al*., 2006; Gutierrez *et al.,* 1999; Kiritsakis, 1998). Olive cultivar is one of the most important factors that affect the quality of olive oil34. In addition to the effects of cultivar, the degree of fruit ripeness, and the industrial processes used for oil extraction, as well as the quality of the fruit from which oil is extracted has a great effect on olive oil quality (Garcia and Yousfi, 2006). The establishment of new olive plantations, the incidence of wilting, dieback and death of young trees has also increased, alarming olive farmers (Chliyeh *et al.*, 2014).

Phytoplasmas constitute a monophyletic clade within the class Mollicutes. Their classification has been possible by the use of restriction fragment length polymorphism analysis (RFLP) and sequencing of the conserved 16S rRNA gene; the majority of phytoplasmas were classified into 15 (Lee *et al.,* 1998; Montano *et al.,* 2001) or 20 16S rDNA groups, encompassing a large number of subgroups (Caglayan *et al.,* 2011) On this basis, the phytoplasmas identified in olive trees have been classified as 16S-IB (Aster yellows group), 16S-VA (Elm yellows group) and 16S-XIIA (Stolbur group) (Pasquini *et al.*, 2000).

Some viruses are well characterized and infect many crops whereas others are apparently restricted to olive trees. Some of them are rare and have been detected sporadically while others are present in different countries and have a high incidence of infection in olive plants (Çağlayan *et al.,* 2011). For the sake of presentation, these viruses can be divided in two main groups: viruses identified for the first time in olive trees (viruses named after olives) and viruses already known to infect different crops and subsequently identified in olive trees (other viruses) (Çağlayan *et al*., 2011). As the same, the olive tree is susceptible to different bacteria which can provoke damage and yield loss.

The aim of this work is to prepare an Inventory about the viral and bacterial diseases of the olive tree (*Olea europaea* L.) and to study their Geographical distribution in the world.

II. CATALOG

II-1- viruses:

• Olive leaf yellowing associated virus (OLYaV): Croitia (Godena *et al*., 2016; Luigi *et al.,* 2011; Bjelis *et al.,* 2007); **Italy** (Loconsole *et al.,* 2013; Cutuli *et al*., 2011; Rwahnih e*t al.,* 2011; Savino *et al*., 2011; Al-abdallah *et al.,* 2010; Montemurro *et al.,* 2008; El Beaino *et al.,* 2007, 2005; Faggioli *et al.,* 2005; Savino *et al.,* 2004; Saponari *et al.,* 2004, 2002a, 2001a, 2001b; Albanese *et al*., 2003; Martelli, 2002; Bellini *et al*., 2002; Bartolini *et al*., 2002; Bottalico *et al.,* 2002; Abou Ghanem *et al.,* 2001; Savino *et al.,* 1996; Grieco *et al*., 2000; Sabanadzovic *et al.,* 1999; Maretti and Gallitelli, 1985); **California** (Essakhi *et al.,* 2006; Al Rwahnih *et al.,* 2011); **Albania** (Luigi *et al.,* 2009) ; **Turkey** (Erǧlmez and Erkan, 2016, 2014; Çǧfçǧ and Serçe, 2014;); **Tunisia** (Boulila, 2016; Rwahnih e*t al.,* 2011; El Air *et al.,* 2011); **Lebanon** (Fadel *et al.,* 2005); **Egypt** (Rwahnih e*t al.,* 2011; Youssef *et al.,* 2010); **Spain** (Rwahnih e*t al.,* 2011; Bertolini *et al.,* 1998); **Israel (**Al Rwahnih e*t al.,* 2011); **Greece** (Rwahnih e*t al.,* 2011); **Australia** (Rwahnih e*t al.,* 2011); **Cyprus** (Rwahnih e*t al.,* 2011); **Chile** (Rwahnih e*t al.,* 2011); **France** (Rwahnih e*t al.,* 2011); **Syria** (Rwahnih e*t al.,* 2011; Abdine *et al.,* 2007; Al Abdullah, 2004); **Palestine** (Rwahnih e*t al*., 2011); **Morocco** (Rwahnih e*t al.,* 2011); **Algeria** (Rwahnih e*t al.,* 2011).

• Cherry leaf roll virus (CLRV): Croitia (Godena *et al.,* 2016, 2012; Luigi *et al.,* 2011; Bjelis *et al.,* 2007); **Italy** (Ferretti *et al.,* 2017; Martelli, 2013a, 2013b; Loconsole *et al.,* 2013; Savino *et al*., 2011; Al-abdallah *et al.,* 2010; Faggioli *et al.,* 2005; Savino *et al.,* 2004; Saponari *et al.,* 2004, 2002a, 2002b, 2002c, 2001a, 2001b; Martelli, 2002; Bartolini *et al*., 2002; Bellini *et al.,* 2002; Bottalico *et al.,* 2002; Pantaleo *et al.,* 2001; Grieco *et al*., 2000; Leitao *et al*., 1999; Martelli *et al.,* 1995; Maretti and Gallitelli, 1985; Savino and Gallitelli, 1981); **Spain** (Bertolini *et al*., 2001a, 2001b, 1998; Grieco *et al*., 2000); **Portugal** (Félix *et al*., 2002; Grieco *et al*., 2000 ; da Clara Henriques, 1994; **Lebanon** (Fadel *et al.,* 2005); **Tunisia** (Boulila, 2016; El Air *et al.,* 2011); **Egypt** (Youssef *et al.,* 2010) ; **Turkey** (Erǧlmez and Erkan, 2016, 2014; Çǧfçǧ and Serçe, 2014; Yalçın *et al.,* 2008; Beler and Açikgöz, 2005; Caglayan *et al.,* 2004); **Albania** (Luigi *et al.,* 2009); **Syria** (Abdine *et al.,* 2007; Al Abdullah *et al.,* 2005).

• Strawberry latent ring spot virus (SLRSV): Croitia (Godena *et al.,* 2016; Luigi *et al.,* 2011; Bjelis *et al.,* 2007); **Italy** (Loconsole *et al.,* 2013; Savino *et al*., 2011; Faggioli *et al.,* 2005, 2002; Savino *et al.,* 2004; Pantaleo *et al.,* 2001; Ferretti *et al.,* 2002; Bellini *et al.,* 2002; Martelli, 2002; Saponari *et al.,* 2002a, 2002b, 2001a, 2001b; Bartolini *et al*., 2002; Grieco *et al*., 2000; Martelli *et al.,* 1995; Barba, 1993; Marte *et al*., 1986; Maretti and Gallitelli, 1985 Savino *et al.,* 1979; Pacini and Cresti, 1977); **Spain** (Bertolini *et al*., 2001a; 2001b, 1998; da Clara Henriques, 1994; Grieco *et al*., 2000); **Portugal**

(Félix *et al*., 2002; Grieco *et al*., 2000; Leitao *et al.*, 1999; Henriques *et al.*, 1992, 1990); **Lebanon** (Fadel *et al.*, 2005); **Tunisia** (Boulila, 2016; El Air *et al.*, 2011); **Egypt** (EL-Morsy *et al.*, 2017; Youssef *et al.*, 2010), **California** (Saponari and Savino, 2003); **Turkey** (Çġfçġ and Serçe, 2016, 2014; Yalçın *et al.*, 2008; Beler and Açikgöz, 2005; Caglayan *et al.*, 2004), **Syria** (Abdine *et al.*, 2007; Al Abdullah *et al.*, 2005, 2004); **Albania** (Luigi *et al.*, 2009).

• Arabis mosaic virus (ArMV): Croitia (Godena *et al.*, 2016; Luigi *et al.*, 2011); **Italy** (Loconsole *et al.*, 2013; Savino *et al*., 2011; Al-abdallah *et al.*, 2010; Faggioli *et al.*, 2005; Savino *et al.*, 2004; Martelli, 2002; Bellini *et al.*, 2002; Bartolini *et al*., 2002; Saponari *et al.*, 2002a, 2002b, 2001a, 2001b; Pantaleo *et al.*, 2001; Grieco *et al*., 2000; Martelli *et al.*, 1995; Maretti and Gallitelli, 1985; Savino *et al.*, 1979); **Spain** (Bertolini *et al*., 2001a, 1998); **Lebanon** (Fadel *et al.*, 2005); **Tunisia** (Boulila, 2016; El Air *et al.*, 2011); **Portugal** (Félix *et al*., 2002; da Clara Henriques, 1994; **Egypt** (Youssef *et al.*, 2010) ; **Turkey** (Erġlmez and Erkan, 2016; Çġfçġ and Serçe, 2014; Yalçın *et al.*, 2008; Beler and Açikgöz, 2005; Caglayan *et al.*, 2004); **Albania** (Spahiu and Veizi, 2012; Luigi *et al.*, 2009); **Croatia** (Bjelis *et al.*, 2007); **California** (Rwahnih e*t al.*, 2011) ; **Syria** (Abdine *et al.*, 2007; Al Abdullah *et al.*, 2005; Al Abdullah, 2004).

• Olive latent virus-1 (OLV-1): Italy (Martelli, 2013a, 2013b, 2002; Loconsole *et al.*, 2013; Al-abdallah *et al.*, 2010; Pantaleo *et al.*, 2006, 2001, 1999; Castellano *et al.*, 2005; Savino *et al.*, 2004; Bellini *et al.*, 2002; Bartolini *et al*., 2002; Bellini *et al.*, 2002; Saponari *et al.*, 2002a, 2002b, 2002c, 2001a, 2001b; Grieco *et al*., 1996a, 1995; Merciega *et al*., 1996; Savino *et al.*, 1996; Martelli *et al.*, 1995; Vanessa, 1995; Castellano *et al*., 1987; Maretti and Gallitelli, 1985; Gallitelli and Savino, 1985), **Jordan** (Grieco *et al*., 2000; Merciega *et al*., 1996; Martelli *et al.*, 1996, 1995); **Portugal** (Varanda *et al*., 2015; 2014a, 2014c; 2010, 2009, 2008; dos Santos, 2015; Gaspar, 2014; Felix *et al.*, 2011, 2007, 2001; Varanda, 2011; Félix, 2007, 2006a, 2006b; 2005a, 2005b, 2004; Felix, 2007; Felix and Clara, 2006, 2000, 1998; Lobão *et al.*, 2002; Cardoso *et al.*, 2005; Grieco *et al*., 2000; da Clara Henriques, 1994); **Lebanon** (Fadel *et al.*, 2005), **Syria** (Abdine *et al.*, 2007; Al Abdullah *et al.*, 2005, 2004); **Turkey** (Erġlmez and Erkan, 2014; Çġfçġ and Serçe, 2014; Yalçın *et al.*, 2008; Serce *et al.*, 2007; Grieco *et al*., 2000; Merciega *et al*., 1996); **Japan** (Kanematsu *et al.*, 2001); **Spain** (Bertolini *et al*., 2001a, 1998; Grieco *et al*., 2000); **Tunisia** (Boulila, 2016; El Air *et al.*, 2011); **Egypt** (Youssef *et al.*, 2010); **Albania** (Luigi *et al.*, 2009); **Croatia** (Godena *et al.*, 2016; Luigi *et al.*, 2011; Bjelis *et al.*, 2007); **California** (Al Rwahnih *et al.*, 2011).

• Cucumber mosaic virus (CMV): Croitia (Godena *et al.*, 2016; Luigi *et al.*, 2011; Bjelis *et al.*, 2007); **Italy** (Loconsole *et al.*, 2013; Savino *et al*., 2011; Al-abdallah *et al.*, 2010; Faggioli *et al.*, 2005; Martelli, 2002; Saponari *et al.*, 2002a, 2001a; Bellini *et al.*, 2002; Bartolini *et al*., 2002; Grieco *et al*., 2000; Martelli *et al.*, 1995; Maretti and Gallitelli, 1985; Savino and Gallitelli, 1983a); **Spain** (Rwahnih e*t al.*, 2011; Bertolini *et al*., 2001a, 2001b, 1998; Grieco *et al*., 2000); **Portugal** (Gaspar, 2014; Felix and Clara, 2006; Félix *et al*., 2002; Grieco *et al*., 2000; Leitao *et al*., 1999; da Clara Henriques, 1994; Rei *et al.*, 1993); **Tunisia** (Boulila, 2016; Rwahnih e*t al.*, 2011; El Air *et al.*, 2011); **Egypt** (Rwahnih e*t al.*, 2011 ; Youssef *et al.*, 2010); **California** (Al Rwahnih *et al.*, 2011); **Albania** (Luigi *et al.*, 2009); **Turkey** (Erġlmez and Erkan, 2016, 2014; Çġfçġ and Serçe, 2014; Beler and Açikgöz, 2005; Caglayan *et al.*, 2004); **Syria** (Rwahnih e*t al.*, 2011; Abdine *et al.*, 2007; Al Abdullah, 2004); **Algeria** (Rwahnih e*t al.*, 2011); **Australia** (Rwahnih e*t al.*, 2011); **France** (Rwahnih e*t al.*, 2011); **Cyprus** (Rwahnih e*t al.*, 2011); **Israel** (Rwahnih e*t al.*, 2011); **Morocco** (Rwahnih e*t al.*, 2011); **Palestine** (Rwahnih e*t al.*, 2011); **Greece** (Rwahnih e*t al.*, 2011); **Lebanon** (Choueiri *et al.*, 2015).

• Olive latent virus-2 (OLV-2): Croitia (Godena *et al.*, 2016; Luigi *et al.*, 2011; Bjelis *et al.*, 2007); **Italy** (Loconsole *et al.*, 2013; Savino *et al*., 2011; Al-abdallah *et al.*, 2010; Faggioli *et al.*, 2005; Martelli, 2002; Bellini *et al.*, 2002; Bartolini *et al*., 2002; Saponari *et al.*, 2002a, 2001a, 2001b; Pantaleo *et al.*, 2001; Grieco *et al*., 1996b, 2002, 2000; Martelli *et al.*, 1995; Castellano *et al.*, 1987; Maretti and Gallitelli, 1985; Savino *et al.*, 1984; Corte *et al.*, 1961); **Spain** (Bertolini *et al*., 2001a, 1998; Grieco *et al*., 2000); **Syria** (Abdine *et al.*, 2007; Al Abdullah *et al.*, 2005, 2004) ; **Lebanon** (Grieco *et al*., 2000); **Tunisia** (Boulila, 2016; El Air *et al.*, 2011); **Egypt** (Youssef *et al.*, 2010) ; **Greece** (Vovlas *et al.*, 2002); **Turkey** (Erġlmez and Erkan, 2016, 2014; Çġfçġ and Serçe, 2014; Yalçın *et al.*, 2008); **Albania** (Spahiu and Veizi, 2012; Luigi *et al.*, 2009); **Portugal** (Gaspar, 2014; Henriques *et al.*, 1992, 1990).

• Olive latent virus-3: Syria (Rwahnih e*t al.*, 2011 ; Al Abdullah *et al.*, 2010); **Turkey** (Çġfçġ and Serçe, 2016, 2014; Erġlmez and Erkan, 2014; Rwahnih e*t al.*, 2011Al Abdullah *et al.*, 2010); **Italy** (Rwahnih e*t al.*, 2011 ; Elbeaino *et al*., 2011; Al Abdullah *et al.*, 2010); **Lebanon** (Rwahnih e*t al.*, 2011; Al Abdullah *et al.*, 2010); **Greece** (Rwahnih e*t al.*, 2011; Al Abdullah *et al.*, 2010); **Malta** (Rwahnih e*t al.*, 2011; Al Abdullah *et al.*, 2010); **Portugal** (Gaspar, 2014; Rwahnih e*t al.*, 2011; Al Abdullah *et al.*, 2010); **Tunisia** (Rwahnih e*t al.*, 2011; Al Abdullah *et al.*, 2010).

• Olive semilatent virus (OSLV): Italy (Loconsole *et al*., 2013; 2010; Martelli *et al*., 2013, 2002; Faggioli *et al*., 2005; Bellini *et al*., 2002; Bartolini *et al*., 2002; Bertolini *et al*., 2001b; Saponari *et al*., 2001; Grieco *et al*., 2000; Maretti and Gallitelli, 1985; Materazzi *et al*., 1996) ; **Turkey** (Çġfçġ and Serçe, 2016, 2014) ; **Portugal** (Gaspar, 2014).

• Olive mild mosaic virus (OMMV): Portugal (Varanda *et al*., 2015, 2014b, 2014c; 2011a, 2011b, 2010, 2009, 2008; dos Santos, 2015; Gaspar, 2014; Varanda *et al*., 2014; Félix *et al*., 2011, 2007; Cardoso *et al*., 2012, 2009, 2005; Felix, 2007; Felix and Clara, 2006; Félix and Clara, 2002); **Italy** (Martelli, 2013a, 2013b; Loconsole *et al*., 2013; Loconsole *et al*., 2010; Bartolini *et al*., 2002; Bellini *et al*., 2002); **Greece** (Gratsia *et al*., 2012); **Turkey** (Çġfçġ and Serçe, 2014); **Spain** (Bertolini *et al*., 2001a).

• **Olive yellow mottling and decline associated virus (OYMDaV): Italy** (Martelli, 2002, 1999; Bartolini *et al*., 2002; Saponari *et al*., 2001; Grieco *et al*., 2000; Savino *et al*., 1996; Faggioli and Barba, 1995; Maretti and Gallitelli, 1985); **Turkey** (Çġfçġ and Serçe, 2014); **Portugal** (dos Santos, 2015; Gaspar, 2014); **Spain** (Bertolini *et al*., 2001a).

• **Olive latent ringspot virus (OLRSV): Croitia** (Luigi *et al*., 2011; Bjelis *et al*., 2007); **Italy** (Loconsole *et al*., 2013; Martelli *et al*., 2013b; Al-abdallah *et al*., 2010; Montemurro *et al*., 2008; Faggioli *et al*., 2005, 2002; Saponari *et al*., 2002a; Martelli, 2002; Bellini *et al*., 2002; Bartolini *et al*., 2002; Pantaleo *et al*., 2001; Saponari *et al*., 2001; Alkowni *et al*., 2000a, 2000b; Grieco *et al*., 2000; Martelli *et al*., 1995; Savino *et al*., 1983; Savino and Gallitelli, 1983b); **Tunisia** (Boulila, 2016; El Air *et al*., 2011); **Portugal** (Gaspar, 2014; Grieco *et al*., 2000); **Egypt** (Youssef *et al*., 2010); **Turkey** (Erġlmez and Erkan, 2016, 2014; Çġfçġ and Serçe, 2014; Yalçın *et al*., 2008; Caglayan *et al*., 2004) ; **Syria** (Abdine *et al*., 2007; Al Abdullah *et al*., 2005, 2004); **Lebanon** (Choueiri *et al*., 2015).

• **Olive vein yellows associated virus (OVYaV): Croitia** (Luigi *et al*., 2011); **Italy** (Martelli, 2013; Bellini *et al*., 2002; Bartolini *et al*., 2002; Martelli *et al*., 2002; Saponari *et al*., 2001; Grieco *et al*., 2000; Martelli, 1999; Martelli *et al*., 1995; Faggioli and Barba, 1995; Maretti and Gallitelli, 1985); **Turkey** (Erġlmez and Erkan, 2016, 2014; Çġfçġ and Serçe, 2014); **Portugal** (Gaspar, 2014, Henriques *et al*., 1992, 1990).

•**Tobacco necrosis virus D (TNV): Croitia** (Godena *et al*., 2016; Luigi *et al*., 2011), **Portugal** (Varanda *et al*., 2015a, 2015b, 2014a, 2014b, 2014c; dos Santos, 2015; Gaspar, 2014; Al-abdallah *et al*., 2012; Varanda *et al*., 2011; Felix *et al*., 2011, 2007, 2005; Cardoso *et al*., 2012; 2009; 2005, 2004; Varanda, 2011; Varanda *et al*., 2010; Felix, 2007; Pantaleo *et al*., 2006, 1999; Felix and Clara, 2006; 2002, 2000); **Italy** (Martelli, 2013a, 2013b, 2002; Loconsole *et al*., 2013, 2010; Savino *et al*., 2011; Bartolini *et al*., 2002; Saponari *et al*., 2001; Martelli *et al*., 2002, 1996; Grieco *et al*., 2000, 1992; Triolo *et al*., 1996; Vanessa, 1995; Maretti and Gallitelli, 1985); **Albania** (Spahiu and Veizi, 2012; Luigi *et al*., 2009) ; **California** (Rwahnih e*t al*., 2011); **Turkey** (Erġlmez S., Erkan S., 2014; Çġfçġ and Serçe, 2014); **Spain** (Bertolini *et al*., 2001a).

• Tobacco mosaic virus (TMV): Italy (Martelli, 2013a, 2013b, 2002; Loconsole *et al*., 2013; Savino *et al*., 2011; Loconsole *et al*., 2010; Faggioli *et al*., 2005; Bartolini *et al*., 2002; Saponari *et al*., 2001; Grieco *et al*., 2000, 1992; Triolo *et al*., 1996; Martelli *et al*., 2002, 1996; Vanessa, 1995; Maretti and Gallitelli, 1985, Savino *et al*., 1983); **California** (Rwahnih e*t al*., 2011); **Jordan** (Martelli *et al*., 1995).

II- 2- Bacteria:

• *Pseudomonas savastanoi*. pv. *Savastanoi* : Spain (Gómez-Lama *et al*., 2017; Caballo-Ponce *et al*., 2017; Pérez-Mendoza *et al*., 2014; Passos da Silva *et al*., 2014; Aragon *et al*., 2015, 2014a; 2014b; Matas *et al*., 2014, 2012, 2010, 2009; Maldonado-González *et al*., 2013; Ramos *et al*., 2012; Rodríguez-Moreno *et al*., 2010, 2008; Pérez-Martinez *et al*., 2010, 2008, 2007; Queseda *et al*., 2012, 2010a, 2010b, 2007; Trapero *et al*., 2009; Rodríguez-Moreno *et al*., 2009, 2008; Cayuela *et al*., 2006; Martos-Moreno *et al*., 2006; Penyalver *et al*., 2006, 2005, 2003, 2000, 1998; Rojas *et al*., 2004; Bertolini, 2003; Bertolini *et al*., 2003a, 2003b, 2002; García *et al*., 2001; Lopez-Villalta, 1999; Rojas, 1999; Alvarez *et al*., 1998; García de los Ríos, 1989; Jiménez Diaz, 1985; Beltra, 1961, 1958); **Italy** (Moretti *et al*., 2017; 2016; Buonaurio *et al*., 2015; Moretti *et al*., 2014a, 2014b, 2014c, 2014d, 2011; Passos da Silva *et al*., 2014, 2013; Lamichhane and Varvaro, 2013; Marchi *et al*., 2009, 2006, 2005; Hosni *et al*., 2011, Tous *et al*., 2010; Hosni, 2010; Tegli *et el*., 2010; Sisto *et al*., 2010, 2007, 2004, 2002, 2001; Cimmino *et al*., 2008; Moretti *et al*., 2008; Cimmino *et al*., 2006; Catara *et al*., 2005; Capuzzo *et al*., 2005; Scortichini *et al*., 2004; Cortese *et al*., 2004; Cinelli *et al*., 2014; 2003; Surico and Marchi, 2003; Martelli *et al*., 2002; Morea *et al*., 1999; Balestra and Varvaro, 1997; Surico, 1993, 1977; Lavermicocca *et al*., 1999, 1998; Mugnai *et al*., 2004; Varvaro and Martella, 1993; Tommasini, 1992; Surico and Iacobellis, 1991; Surico and Lavermicocca, 1989; Evidente and Surico, 1986; Casano, 1985; Surico *et al*., 1985a, 1985b, 1984; Hassani *et al*., 2003; Lavermicocca *et al*., 2003, 2002; Godini eg al., 2002; Iacobellis, 2001; Sisto and Iacobellis, 1999, 1992; Iacobellis *et al*., 1998 ; 1995, 1994, 1993; Capasso *et al*., 1997, 1995; Protta, 1995; Ercolani, 1999, 1985, 1983,

1978, 1970; Caponero *et al*., 1995; Wells *et al.*, 1991; Graniti, 1993; Evidente *et al.*, 1986; Varvaro and Ferrulli, 1983; Varvaro and Surico, 1987; 1984; Baratta and Marco, 1981; Varvaro and Surico, 1978a, 1978b; Surico *et al*., 1975; Botalico and Ercolani, 1971;; Sands *et al.*, 1970; Domenico, 1969; Ciccarone, 1950; Petri, 1915; Petri, 1909; Savastano, 1908, 1889, 1887, 1886, 1878); **France** (Rodríguez-Palenzuela *et al*., 2010; Bardaji *et al*., 2011; Gaudin *et al.*, 1994; Gardan *et al.*, 1992a; 1992b; Abu-Ghorrah, 1988); **Jordan (**Khlaif, 2006; Tehabsim *et al*., 1991); **Tunisia** (Ghanney *et al.*, 2016, Trigui *et al.*, 2013; Krid *et al*., 2012; 2011a, 2011b, 2010, 2009; Mehri *et al*., 2009; Ouzari *et al*., 2008; Jardak *et al.*, 2004; Boulila and Mahjoub, 1994; Boulila *et al.*, 1993); **California** (Nguyen *et al*., 2017; Úrbez-Torres *et al.*, 2013; Fichtner *et al*., 2012; Adaskaveg, *et.al.*, 2012; Teviotdale, 2005; Feil *et al.*, 2005; Teviotdale and Krueger, 2004, 1998; Rice *et al.*, 2003; Penyalver *et al.*, 2000; Krueger *et al.*, 1999; Scroth, 1995; Teviotdale, 1994; Soby *et al.*, 1993; Wilson and Lindow, 1992; Da Costa E Silva and Kosuge, 1991; Janse, 1991, 1982; Gaffney *et al.*, 1990; Roberto *et al.*, 1990; Palm *et al*., 1989; Glass and Kosuge, 1988, 1986; Roberto and Kosuge, 1987; Lang, 1987; Macdonald *et al.*, 1986; Martin, 1986; Yamada *et al.*, 1986; Smidt and Vidaver, 1986; Hutcheson and Kosuge, 1985; Comai and Kosuge, 1983; Comai *et al*., 1982; Comai and Kosuge, 1982, 1980; Shoemaker *et al.*, 1979; Wilson and Ogawa, 1979; Smidt and Kosuge, 1978; Hartmann, 1973; Marlow and Kosuge, 1972; Wilson *et al*., 1972; Kuo and Kosuge, 1969; Hutzinger and Kosuge. 1968; Kosuge *et al*., 1966; Wilson, 1965, 1935; Wilson and Maggie, 1964, 1963, 1962; Hagen, 1963; Sutic and Dowson, 1963; Ark and Thompson, 1960; Hartmann, 1949; Hewitt, 1938; Brown, 1932; Smith, 1922, 1908; Horne *et al*., 1912; Smith and Rorer, 1904); **Algeria** (Kacem *et al.*, 2009; Kacem and Kazouz, 2009); **Morocoo** (Bouaichi *et al.*, 2015; Mahhou *et al*., 2012; Benjama, 2003, 2002, 1994, 1990, 1989, 1988, 1987; Benjama *et al.*, 2002, 1992, 1993, 1987; Benjama and Gardan, 1995; Moukhli, 1984; Rieuf and Teasca, 1970); **Portugal** (Campos *et al*., 2009; Gemas *et al.*, 2004; Oliveira and Luz 2003; Fernandes and Marcelo, 2002; Marcelo *et al.*, 1999); **New Zealand** (Young, 2014a, 2004b, 1987; Wilson *et al.*, 2004; Young *et al.*, 1996; Young and Triggs, 1994, Braithwaite *et al.*, 1999; Dye, 1956); **Lebanon** (Temsah *et al*., 2008, 2007a, 2007b, 2007c; Saad and Hanna, 2002; Saad and Melkonian, 1992; Saad and Nienhaus, 1969; Weltzien, 1963); **Greece** (Hatzopoulos *et al.*, 2002; Roussos *et al.*, 2002; Roussos and Pontikis, 2002; Krueger *et al*., 1999; Schroth, 1995; Pyrowolakis and Weltzein, 1974; Panagopoulos, 1993; Tjamos *et al*., 1993; Schroth and Hildebrand, 1968; Schroth *et al*., 1973, 1968); **Australia (**Spooner-Hart *et al.*, 2009; Hall *et al*., 2004, 2003; Kailis and Sweeney, 2002; Moffett, 1983; Sampson and Walker, 1982; Warcup and Talbot, 1981; Noble *et al.*, 1935; Adam and Pugsley, 1934); **Iraq** (Osman *et al*., 1980a, 1980b); **Turkey** (Bozkurt *et al.*, 2014; Servi and Baştaş, 2012; Mirik and Aysan, 2011; Kavak and Üstün, 2009; Mirik *et al.*, 2006; Basim *et al*., 2006, 2000; Tatlı and Benlioğlu, 2004 ; Basim, 2002; Basim and Ersoy, 2001; Azeri, 1993); **Nepal** (Balestraa *et al*., 2009); **Iran** (Rokni-Zadeh *et al.*, 2008); **Syria** (Alabdalla *et al.*, 2009); **China** (Haigen *et al.*, 2006); **Croatia** (Godena *et al.*, 2009; Škarica *et al.*, 1996; Žužić and Ciglar, 1987); **Egypt** (Ahmad *et el.*, 2009); **Japan** (Tsuji *et al.*, 2017; 2015).

• ***Xylella fastidiosa*** : **Italy** (Bleve *et al.*, 2016; Pashaei *et al.*, 2016; Mang *et al.*, 2016; Moussa *et al.*, 2016; Cornara *et al.*, 2016; Martelli, 2016, 2013; Loconsole *et al.*, 2016; 2014a; 2014b; Cornara *et al.*, 2016; 2014; Bosso *et al*., 2016; Almeida, 2016; Saponari *et al.*, 2016; 2014a, 2004b, 2014c, 2013; Martelli *et al.*, 2016; Giampetruzzi *et al.*, 2016, 2015; Abbot, 2015; Fichtner *et al.*, 2015; Yaseen *et al.*, 2015; Alison, 2015; Simpson, 2015; Almeida and Nunney, 2015; EFSA, 2015; Djelouah *et al*., 2014; Elbeaino *et al.*, 2014a, 2014b; White *et al.*, 2014; Frisullo *et al.*, 2014; Cariddi *et al.*, 2014; Boscia, 2014; Carlucci *et al.*, 2013); **California** (Krugner *et al.*, 2014, 2010; Krugner, 2010; Hernandez-Martinez *et al.*, 2007, Chen *et al.*, 2005; Costa *et al.*, 2004; Wong *et al.*, 2004); **Argentina** (Haelterman *et al*., 2015) ; **Brazil** (Coletta-Filho *et al.*, 2016) ; **Florida** (Hopkins, 2014) ; **Spain** (Lopes *et al.*, 2014) ; **Portugal** (Pereira, 2015); **Slovenia** (Orešek and Seljak, 2015).

II-3 : Phytoplasma :

Italy (Martelli *et al.*, 2013; 2000; 1999; Albanese *et al.*, 2012; Saponari and Savino, 2003; Pasquini *et al.*, 2000; Marzachi and Poggi Pollini, 2000; Marzachi *et al.*, 2000; Serrone *et al*., 1996; Poggi Pollini *et al*., 1996; Danielli *et al*., 1996); **Albania** (Luigi *et al.*, 2009); **Iran** (Ghayeb Zamharir and Razavi, 2016; Ahangaran *et al.*, 2006); **Spain** (Font *et al*., 1998) ; **Australia** (Spooner-Hart *et al.*, 2007).

III. RESULTS AND DISCUSSION

Olive, like other crops, is not free from virological problems. The first report on a probable viral disease of olive goes back to 1938 (Pesante, 1938) and, since then, several virus-like diseases and viruses have been reported. Basing on all the available data in table 1, 15 viruses were reported in the olive tree. The most widespread were respectively Cucumber mosaic virus (CMV) and Olive leaf yellowing associated virus (OLYaV) in 19 countries for each; Followed by Olive latent virus-1 (OLV-1) (13 countries), Strawberry latent ring spot virus (SLRSV) and Arabis mosaic virus (ArMV) and Olive latent virus-2

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(OLV-2) with 11 countries for each, Cherry leaf roll virus (CLRV) (10 countries), Olive latent virus-3 (8 countries), Olive latent ringspot virus (OLRSV) (8 countries), Tobacco necrosis virus D (TNV) (7 countries), Olive mild mosaic virus (OMMV) (5 countries), Olive vein yellows associated virus (OVYaV) (4 countries). Olive yellow mottling and decline associated virus (OYMDaV) (4 countries) and the less widespread viruses were Tobacco mosaic virus (TMV) *and* Olive semilatent virus (OSLV) found in 3 countries for each. Martelli *et al.* (2002) have identified 14 virus species of 8 genera in olive trees, one more virus was not cited in their work, and it is OLV-3. This Virus was widespread in Syria, Turkey, Italy, Lebanon, Greece, Malta, Portugal, Syria and Tunisia.

Table.1: Geographical distribution of the olife tree viruses per continent:

	Europe	Africa	America	Asia	Australia – New Zealand
Olive leaf yellowing associated virus (OLYaV)	++++++++ Spain-Italy-Croitia-Albania- Turkey-Greece- Cyprus- France	++++ Tunisia-Morocco-Algeria- Egypt	++ California-Chile	+++ Syria-Lebanon-Palestine-Israel	+ Australia
Cherry leaf roll virus (CLRV)	+++++ Croitia- Italy- Spain-Portugal- Albania-Turkey	++ Egypt- Tunisia	-----	++ Lebanon-Syria-	--
Strawberry latent ring spot virus (SLRSV)	+++++ Croitia- Italy- Spain-Portugal- Turkey-Albania	++ Egypt- Tunisia	+ California	++ Lebanon-Syria	--
Arabis mosaic virus (ArMV)	+++++++ Croitia- Italy- Spain-Portugal- Turkey-Croatia- Albania	++ Egypt Tunisia-	+ California	++ Syria-Lebanon-	--
Olive latent virus-1 (OLV-1)	++++++ Italy- Portugal- Turkey-Spain- Croatia- Albania	++ Egypt- Tunisia	+ California	++++ Jordan-Lebanon-Syria-Japan	--
Cucumber mosaic virus (CMV)	+++++++++ Croitia- Italy- Spain-Portugal- Albania-Turkey- France- Cyprus-Greece	+++ Egypt - Algeria-Tunisia Morocco	+ California	++++ Syria-Israel-Palastine Lebanon	+ Australia
Olive latent virus-2 (OLV-2)	+++++++ Croitia- Italy- Greece-Portugal- Spain-Albania- Turkey-	++ Tunisia- Egypt	----	++ Syria-Lebanon	--
Olive latent virus-3 (OLV-3)	+++++ Turkey- Italy- Greece-Malta- Portugal-	+ Tunisia	----	++ Syria-Lebanon	--
Olive semilatent virus (OSLV)	+++ Italy- Turkey- Portugal	----	----	----	----
Olive mild mosaic virus (OMMV)	+++++ Portugal- Italy- Greece-Turkey- Spain	----	----	----	----

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Olive yellow mottling and decline associated virus (OYMDaV)	++++ Portugal- Italy- Turkey- Spain	----	----	----	----
Olive latent ringspot virus (OLRSV)	++++ Croitia- Italy- Portugal- Turkey	++ Tunisia-Egypt	----	++ Syria- Lebanon	----
Olive vein yellows associated virus (OVYaV)	++++ Croitia- Italy- Portugal- Turkey	----	----	----	----
Tobacco necrosis virus D (TNV)	++++++ Croitia- Portugal- Italy- Albania- Turkey- Spain	----	+ California	----	----
Tobacco mosaic virus D (TMV)	+ Italy	----	+ California	+ Jordan	----

(+): Present; (-): Absent

Our results were similar to those of Martelli (2013) that viruses of the olive tree were reported in 22 countries in five continents. All viruses were reported in Italy, some of these viruses were found only in the Eurepean continent, such as Olive vein yellows associated virus (OVYaV), Olive yellow mottling and decline associated virus (OYMDaV), Olive mild mosaic virus (OMMV) and Olive semilatent virus (OSLV) (Table 1). Cucumber mosaic virus (CMV) and Olive leaf yellowing associated virus (OLYaV) were in the five continents (Table 1), these two viruses were the only ones reported to the olive tree in Australia (Table 1). We can explain this by the far of this continent to the others that may lead to decrease the dIssemination verctors and factors, or it may caused by the virulence adaptation of these viruses on the olive trees in Australia.

Virus Olive trees are infected with systemic pathogens such as viruses and phytoplasmas as well as agents of diseases of unknown etiology (Çağlayan *et al*., 2011). The first report of a probable viral disease of olive (*Olea europaea* L.) trees goes back to 1938 (Pesante, 1938). Since then, several viruses and phytoplasmas were reported in the Mediterranean countries where olive is economically important and olive oil is considered one the main components of the Mediterranean diet (Çağlayan *et al*., 2011).

Several olive tree diseases caused by viruses were reported from several countries, viruses were mechanically transmitted to indicator plants and of the seven that were subsequently identified, and four belong to the nepovirus group: Strawberry latent ringspot (SLRV), cherry leaf roll (CLRV), arabis mosaic (AraMV) and olive latent ringspot (OLRV); one belongs to the cucumovirus group: cucumber mosaic virus ‘CuMV) and two others have not been assigned to any of the existing groups: olive latent virus-1 (OLV-1) and olive latent virus-2 (OLV-2). Sometimes virus are detected in *Olea* plants that show symptoms, as severely distorted leaves and misshapen fruits – which are particularly evident in infected olive trees in Portugal and in Italy (da clara henriques, 1994)

SLRV was found to be associated to a severe symptomatology of Italian cv. Ascolana tenera, consisting of distorted sickle shaped leaves and fruit deformation (Marte *et al.*, 1986). Leaf symptoms were transmitted to healthy Ascolana plants and virus recovered from these. This work clearly showed a correlation between field symptoms and SLRV infection. Identical severe leaf and fruit symptoms were observed in a Portuguese table olive cv. Negrinha, where SLRV was also diagnosed (Henriques *et al.*, 1990; 1992). In Addition, this virus was also detected in olive plants previously shown to contain virus-like particles in pollen, as well as in apparently normal plants (Savino *et al.*, 1979; Henriques *et al.*, 1992).

ArMV was isolated from declining trees with sickle shaped leaves (Savino *et al*., 1979) and OLRV from plants showing partial defoliation (Savino et al., 1983). CLRV and CMV were recovered from symptomless trees (Savino and Gallitelli, 1983; Rei *et al.*, 1993). OLV-1 was isolated from an olive tree showing some fasciations and bifurcation of leaves and stems (da Clara Henriques, 1994).

OLV-2 was recovered from symptomless olive trees. The virus particles possess a distinctive bacillifrom shape which readily differentiates it from known viruses (Martelli and Gallitelli, 1985). Absence of symptoms in olive trees is by no means a reliable indication of absence of infection. As mentioned before, almost all olive virus isolates could be recovered from assymptomatic trees, with the exception of SLRV infecting Ascolana tenera and Negrinha cvs., where the virus is associated to severe symptoms.

The epidemiology of most olive tree viruses is still unknown. Although some of these viruses are soil-borne (SLRSV, ArMV, TNV) others can be transmitted mechanically (TMV), by seed (CLRV and OLV-1) (Saponari *et al.,* 2002a), by aphids (CMV) or only by mechanical inoculation and grafting (OLV-2 and OLRSV). However, there is very limited knowledge about virus transmission mechanism(s) under field conditions. OLYaV was reported to be detected in mealybugs and psyllids that fed on an infected olive tree (Sabanadzovic *et al.,* 1999) but it is too early to regard these insects as vectors of the virus because preliminary transmission trials were negative.

The fact that olive viruses occur in latent forms, makes it impossible to visually assess infected trees and determine their impact on plant yield. Nepoviruses are known to infect important crops, including grapevine, often grown in close proximity to olives in Mediterranean countries, where they cause considerable losses (da clara henriques, 1994). Cucumovirues have a wide range of hosts, some of high economic importance and may cause severe crop damage (da Clara Henriques, 1994). Thus, it is plausible to respect that viruses of these groups cause deleterious effects on olive trees (da clara henriques, 1994). Severe fruit deformations are associated to SLRV infections in table olive cvs., thus leading to a commercial devaluation of the product. SLRV is also associated to a poor rooting ability of the olive cuttings (Henriques *et al.,* 1992). Olive viruses may also negatively affect vigour, longevity and ability of olive trees to stand environmental stress (da clara henriques, 1994).

Table.2: Geographical distribution of the pathogenic bacteria reported to the olive tree per continent:

	Europe	Africa	America	Asia	Australia – New Zealand
Pseudomonas savastanoi. pv. *savastanoi*	+++++++ Spain- Italy- France- Portugal- Greece- Turkey Croatia	++++ Tunisia- Algeria- Morocoo- Egypt	+ California	+++++++ Jordan- Lebanon- Iraq- Nepal- Iran- Syria- China- Japan	++ New Zealand- Australia
Xylella fastidiosa	++++ Italy- Spain- Portugal- Slovenia	----	+++ USA- Argentina- Brazil	----	----

(+): Present; (-): Absent

Olive knot, caused by *Pseudomonas savastanoi.* pv. *savastanoi* (Pss) is a serious disease of olive (*Olea europaea* L.) in the Mediterranean (Krid *et al.,* 2010). Basing in the available data, this bacteria was detected in 21 countries in five continents, the majority of these countries exist in the Mediterranean Basin. The disease characteristic symptoms are knots that develop as a reaction to factors produced by the bacterium, including indole-3-acetic acid (IAA) (Matas *et al.,* 2009; Rodríguez-Moreno *et al.,* 2008), cytokinins (Surico *et al.,* 1985), products of the type III secretion system (TTSS), encoded by the hrp/hrc gene clusters (Sisto *et al.,* 2004) and a variety of genes encoding known *P. syringae* virulence determinants (Pérez-Martinez *et al.,* 2008). Olive knot disease is characterized by hyperplasia formation on the stems and branches of olive plants and occasionally on the leaves and fruits (Surico, 1986). The disease can cause severe damage in olive groves, mainly when weather conditions favor the survival of epiphytic populations of the pathogen and their entry into the bark. *P. syringae subsp. savastanoi* has epiphytic resident populations on olive twigs, leaves, and drupes, with larger populations on twigs than on leaves as a result of the better survival of the pathogen in the rough bark surface (Lavermicocca, and Surico. 1987).

X. fastidiosa subsp. was deteted in Europe in four countries (Italy, Spain, Portugal and Slovenia) and in America in three countries (USA, Argentina and Brazil) (Table 2). It is endemic to North America only and infects numerous hosts, but generally not grapevine (Davis *et al.,* 1978; Hopkins and Mollenhauer, 1973). *X. fastidiosa* subsp. *pauca* contains South American strains causing citrus variegated chlorosis and coffee leaf scorch (Hopkins and Purcell, 2002). *X. fastidiosa* subsp. *sandyi* comprises closely related strains isolated from oleander in California and Texas (USA). As to olive (*Olea europaea*), there are reports from California, where the bacterium was detected and/or isolated from trees with leaf scorching (Wong *et al.,* 2004), unspecified symptomatology, if any (Hernandez-Martinez *et al.,* 2007), or showing dieback and leaf scorch (Krugner *et al.,* 2010). Its properties, biology, epidemiology and disease

management strategies have been exhaustively described in a number of reviews to which the readers are referred for more detailed infomation (Purcell, 2013; Janse and Obradovic, 2010; Chatterjee *et al.* 2008; Hopkins 1989; Purcell and Hopkins 1996; Redak *et al*. 2004).

The quick decline syndrome of olive (OQDS) caused by *Xylella fastidiosa* is a destructive disorder that appeared suddenly a few years ago in the groves of a restricted area of the Apulian province of Lecce, Salento peninsula, south-east Italy (Martelli, 2013), The disease appeared suddenly in the autumn and spring, mainly on the lower branches of the trees and was particularly severe on "Ogliarola di Lecce", the olive cultivar most widely grown in the area, whereas "Cellina di Nardò", the other major local cultivar, appeared to be resistant (Frisullo *et al.*, 2014), and in Argetina olive trees older than 50 years of age were observed in six orchards of cv. Arauco, which showed symptoms recalling those induced by *Xylella fastidiosa*. Some branches displayed desiccated leaves at the top and basal leaves with apical scorching. Additional symptoms were slow decay, dull green coloration, curling and necrosis of the leaves, partial defoliation and rapid death of shoots and branches.

On this basis, the phytoplasmas identified in olive trees have been classified as 16S-IB (Aster yellows group), 16S-VA (Elm yellows group) and 16S-XIIA (Stolbur group) (Pasquini *et al.*, 2000). After the first report in Italy in 1995, several reports confirmed the association between olive foliage disorders and the presence of phytoplasmas in Spain, Italy and Iran (Font *et al.*, 1998; Pasquini *et al.*, 2000; Ahangaran *et al.*, 2006).

Phytoplasma was detected on the olive tree in five countries, it was responsible of yellow symptoms in a few branches was observed. Some leaves showed diffuse chlorotic mottling affecting almost all the blade, while others showed mottling with green and yellow areas: leaf deformation was also sometimes present (Poggi Pollini *et al.*, 1996). Affected trees exhibited a rather variable range of symptoms: shoot proliferation, leaf rolling, yellowing of leaves and branches, phyllody, fasciation, witches'-brooms, dwarfing, leaf bronzing, abortion of axillary buds, erect growth, appearance of small heads due to clustering of hypertrophoyd inflo- rescences, decline and die-back (Pasquini *et al.*, 2000).

IV.CONCLUSION

Olive tree is an important crop, but it is unfortunately attacked by several pathogens, Fungi, bacteria, viruses, phytoplasmas...., these diseases are widespread in the five continent. 15 viruses were cited as pathogens of the olive tree, showing several symptoms. Some of the existed in all continents on different olive tree varieties, others they were reported just in few countries in the same region or same continent or even in just one country. Two bacteria were cited on the olive tree, which show big damage to the tree such as knots, dieback, decline, defoliation and chlorosis. After this work, we should have a prevention control with diagnostics of to the olive trees coming from other countries caring these pathogens to another country and prevention treatments against bacteria.

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