T. R.
KAHRAMANMARAŞ SÜTÇÜ İMAM UNIVERSITY
GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES

DETECTION AND IDENTIFICATION OF NEMATODES DENSITIES FOUND IN OLIVE, GRAPE AND MIXED FRUITS GROWN IN NORTH OF IRAQ AND SOUTH OF TURKEY

ROZHEEN SAEED HUSSEIN

MASTER THESIS
DEPARTMENT OF BIOENGINEERING AND SCIENCES

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A thesis submitted in partial fulfillment of the requirements for the degree of Master of Science in Bioengineering and Sciences

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TÜRKİYE'NİN DOĞUSU İLE IRAK'IN KUZEYİNDE YETİŞTİRİLEN ZEYTİN, ASMA VE KARIŞIK MEYVA ALANLARINDAKİ NEMATOT YOĞUNLUKLARININ TESPİTİ VE TANIMLANMASI

(YÜKSEK LİSANS TEZİ)

ROZHEEN SAEED HUSSAIN

ÖZET

Türkiye'nin doğusu ile Irak'ın kuzeyinde yetişen zeytin, asma ve karışık meyva yetiştirilen alanlarından, 2014-15 yıllarında, alınan toprak örneklerinde görülen nematodların trofik yapı ve cinslerine göre yoğunlukları, dağılımları ve biyoçeşitlilikleri araştırılmıştır. Her iki ülkeden alınan toplam 250 toprak örneğinde nematodlar Baermann sistemi yardımı ile elde edimiş ve ışık mikroskobunda teşhisleri yapılmıştır. Çalışmada, dört trofik gruba ait nematode cins sayıları bitki paraziti nematodlar için 12, serbest yaşayanlar için 15, predatörler için 6 ve omnivore nematodlar için ise 6 adet olmuştur. Çalışmada en yüksek nematot sayısı *Aphelenchus* cinsinde bulunmuş olup Türkiye'de sırası ile zeytin, asma ve karışık meyva için bu sayılar 389, 182 and 273 ve Irak'ta ise yine bu sayılar 111, 479 and 84 olmuştur. *Aphelenchus*'u sırası ile *Aphelenchoides, Pratylenchus, Paratylenchus, Tylenchus, Ditylenchus, Helicotylenchus,* ve *Meloidogyne* bitki paraziti cinslerinin izlediği görülmüştür. Diğer taraftan, çalışmada en yüksek serbest yaşayan nematode sayıları *Monhystera* cinsinde bulunmuş olup bunu sırası ile *Wilsonema, Cephalobus, Eucephalobus, Cheloplacus, Rhabditis* and *Acrolobus* izlemiştir. En büyük predator nematot yoğunlukları sırası ile *Eudorylaimus, Labronema,* and *Discolaimus* cinslerinde tespit edilmiştir. Son olarak, çalışmanın genelinde en yüksek omnivor nematot sayıları sırası ile *Ecuminacus, Dorylaimus* and *Mesodorylaimus* cinslerinde görülmüştür. Bu çalışmada tespit edilen nematot sayı ve cinslerine bakıldığında, Irak'ın kuzey bölgesinin Türkiye'nin doğu bölgesine oranla daha zaif bir toprak yapı ve sağlığına sahip olduğu sonucuna varılmıştır. Nematot biyoçeşitliliği ve populasyon yoğunlukları hakkında daha fazla bilgi için daha geniş ürün çeşidinde ve daha detaylı çalışmaların, yapılması gereklidir.

Anahtar sözcükler: Nematot yoğunlukları, biyoçeşitlilik, trofik grouplar, nematot tespiti.

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DETACTION AND IDENTIFICATION OF NEMATODES DENSITIES FOUND IN OLIVE, GRAPE AND MIXED FRUITS GROWN IN NORTH OF IRAQ AND SOUTH OF TURKEY

(M. Sc. THESIS)

ROZHEEN SAEED HUSSAIN

ABSTRACT

The abundance, distribution and biodiversity of nematodes found in three different crops namely olive, grape and mixed fruits growing areas were determined based on their community compositions, trophic group and genera in south part of Turkey and north part of Iraq during 2014-2015. Nematodes from total of 250 collected soil samples were extracted by Baermann systems and identified and quantified by microscopic observations. Total number of genera belonging four trophic groups of nematodes included 12, 15, 6, and 6 for plant parasitic, free living, predaceous and omnivorous nematodes, respectively. In Turkey, the highest numbers of plant parasitic nematodes were found in genus *Aphelenchus* with 389, 182 and 273 individual for olive, grapes and mixed fruits, respectively. Overall, In Iraq, the highest numbers of plant parasitic nematodes were also found in genus *Aphelenchus* with 111, 479 and 84 individual for olive, grapes and mixed fruits, respectively. In the overall study, the greater plant parasitic nematode densities in all three crops from both counties were *Aphelenchus* followed by *Aphelenchoides, Pratylenchus, Paratylenchus, Tylenchus, Ditylenchus, Helicotylenchus*, and *Meloidogyne.* On the other hand, the highest densities of free-living nematodes were observed in *Monhystera, Wilsonema, Cephalobus, Eucephalobus, Cheloplacus, Rhabditis* and *Acrolobus.* The gretest densities of predacious nematodes were detected in *Eudorylaimus*, *Labronema,* and *Discolaimus.* Finally, the greatest omnivorous nematode numbers were retained in genus *Ecuminacus*, *Dorylaimus* and *Mesodorylaimus.* Based on the nematod genus and numbers found in this study, it can be concluded that northern Iraq sustained poorer soil conditions or heath than Turkey. More compherensive studies are needed in both countries with wider crop varieties to learn more of nematode biodiversity and population densities in the regions.

Key words: Nematode densitiy, biodiversity, trophic groups, nematode detection.

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SYMBOLS AND ABBREVIATIONS

mm	: Millimeter
J1	: First stage juvenile
J2	: Second stage juvenile
J3	: Third stage juvenile
J4	: Fourth stage juvenile
L1	: First stage larvae
L2	: Second stage larvae
%	: Percent
N	**:** North latitude
E	: East longitude
^{o}C	: Celsius temperature
cm	: Centimeter
m^{2}	: square meter
g	: Gram
µm	: Micro meter
X	: Magnification

1. INTRODUCTION

Nematodes occupy almost all areas on the globe, including terrestrial and aquatic habitats. Human, plant, animal parasitic forms and microorganism feeding free-living forms are scattered in belonging habitat widely (Freckman and Baldwin, 1990; Bernard, 1992).

Nematodes are multicellular, simple animals. They are soft-bodied (no skeleton), non-segmented, bilaterally symmetrical, worm-like and taxonomically diverse animals. Most nematodes are not pathogens, but rather saprophytes according to Swayne and Miller (2010).

Nematodes are covered by a flexible, thick cuticle secreted by the epidermis. Beneath the epidermis, a layer of longitudinal muscles extends the length of the body. Nematodes exchange oxygen directly through the cuticle due to the lack of respiratory and circulatory system (Calver et al., 2009). They have reproductive organs and digestive tract which are tubular and suspended in the body cavity called pseudocoelom. They consist of three layers: ectoderm, endoderm, and mesoderm (Coleman et al., 2004), nematodes mostly, have sexual dimorphisms. The reproductive organs are longer than the body and coil around the intestinal tract of the individual. Nematodes have excretory and nervous system stated by Sirois (2012).

Ravichandra (2008) indicated that there is a large variability in the nematodes size. Marine species are about 50 mm in length, while animal parasites range from about 1 mm to 7 m in length. Free living nematodes in fresh water and soil differ in length they are about 10 mm. Most plant parasites have a microscopic body width a size of 0.01 to 0.5 mm and with a length of 0.25 mm to approximately 12 mm. It was reported that the longest phytonematode is *Paralongigorus* and the smallest is *Paratylenchus.*

According to anatomical and morphological traits, soil nematodes can be divided into several trophic groups. These are bacterivores, fungivores, omnivores, herbivores or plant-parasitic nematodes. Bacterivores are considered to be very important to bacterial grazers and fungivores are fungi grazing. Omnivores and predators also consume bacteria and protozoa States by Kudrin et al. (2015).). Herbivore or plant parasitic nematodes are becoming economically important pathogens. Plant parasitic groups can cause billions of dollars in agricultural losses annually on a wide range of crop plants (Williamson and

Gleason, 2003). Based on their different feeding habits they may occur as obligate endo or ecto parasites suggested by Steyn (2013).

Nematodes are important membership of soil biomass, therefore they play an essential role in soil ecological functions (Chen et al., 2007). It is well documented that they supply to a variety of functions within the soil system. In agricultural systems, nematodes act as biological control agents and can improve nutrient mineralization (Ugarte and Zaborski, 2014). Nematode structure communities can reflect differences in conditions of Agra ecosystem, soil tillage system, organic adding, river pollution**,** air pollution, heavy metal compounds and different variety of environmental monitoring (Brmez et al., 2007).

Over the last decades, comprehensive studies on the nematode final analysis have been conducted to confirm that nematodes are good bio indicators of soil health (Bileva et al., 2014).

Numerous reports illustrate that the nematodes are known from nearly all ecosystems (Kubicek et al., 2007; Mekete et al., 2012; Escobar and Fenoll, 2015). They can arise in very high density in numerous ecological niches, some soil systems in overload of one million individuals per square meter (Sommer and McGaughran, 2013). Most nematodes are microscopic in size and they are essentially aquatic organisms, living in a range of habitats, from the microscopic film of water surrounding soil particles to oceans (Nega, 2014).

Nematodes have a simple life cycle. The typical nematode undergoes embryonic development inside the eggshell. Postembryonic development composed of four stages, called juveniles (J1–J4), which are separated by molts. Adult nematode arises at last molt (Sommer and Streit, 2011; Lewis and Hong, 2014). The least duration time required for completing the entire life cycle ranging from days to months or even years (Sommer and Streit, 2011).

Some scientists such as Niu and Zhang (2011) and Kibet et al. (2013) reported that Numerically, nematodes may be between 80 and 90 % of all multicellular animals on world, making the nematodes the most abundant multicellular animals on the globe (Bianchelli et al., 2013).

Biodiversity in ecosystem health is recommended to be the eventual measure applied widely. These measures depend on a given effort of sampling and effects of habitat complexity or type. Although related diversity and species richness indices are among the most widely used options for assessing community diversity (Hua et al., 2014), assemblage structure of soil nematodes and the local diversity were also studied at a few sites. These indicate that our knowledge of the assemblage composition and distribution of soil nematodes at a global level is very limited (Nielsen et al., 2014).

Swart (1991) indicated that there is complete study on the morphology, as well as the classification of nematodes. Phylum divided in to two classes, the Phasmidia and Aphasmidia, but after scientist rejected these two names and replaced them with Secernentea and Adenophorea, also he divided the class Nematoda (he regards the Nematoda as a class of the phylum Nemathelminthes) into three subclasses called Secernentia (Orders Tylenchida, Ascarida, Strongylida and Spirurida), Torquentia (Orders Chromadorida, Desmosclecida, Monhysterida and Araeolaimida); and Penetrantia (Orders Enoplida, Trichocephalida, Dorylaimida and Dioctophymatida). According to this system thirteen orders are recognized, eight of which represents free living forms and five, animal parasites.

Morise et al. (2012) noted that the communities of nematode in various soils have been widely studied environmental and agricultural arena, mainly by the morphological and feeding habit-based classification. These analyses need experience and excellent taxonomic skills as well as a great deal of knowledge, such studies could exhibit limitations in terms of sample size.

Harper and Hawksworth (1994) defined biodiversity more exclusive as an expression of the living things variety, as a species, genetic and ecosystem levels. A record of the number of genotypes or species is a simple measure of biodiversity in a biological community.

The phylum Nematoda is one of the most abundant metazoan groups on earth and highly varied in terms of species richness. Scientists predicted the nematode species number in marine habitats to be as high as one hundred million. However, only 26,646 of those species have been recorded (Nega, 2014).

The reason of the low number of described nematode species was attributed to their morphology, the small size of nematodes, lack of nematode taxonomists and the intra specific variation according to Creer et al. (2010). A number of studies on taxonomy increased in the 1990s, resulting identification of more new species and genera (Venekey et al., 2010).

Several studies, reviewed that the total of about 14,000 invertebrate, free-living and plant associated nematode species are accepted, known and described (Platt and Warwick, 1983, 1988; Andrassy, 1992). This total excludes vertebrate parasites for which about another 12,000 species are accepted (Hugo et al., 2001).

In Turkey, it was reported that 172 plant parasitic nematode species were determined until 2000. This data considered not a sufficient study for Nematology in this country and it was noted that there was an increasing number of researchers in the nematology field in parallel to research in biodiversity recently (Kasapoğlu, 2012). Nevertheless, nematodes biodiversity studies are limited in Turkey and there is little known particularly about the free living nematodes (Yildız, 2007)

They are mostly unknown to the general public because of their small size that is hard to observe without a microscope (Sommer and McGaughran, 2013), and because of morphological similarity, overlapping morphometric measurements and limited number of distinguishable taxonomic characters. There is increasing demand in a worldwide context for nematode taxonomists to assess community structure in relation to soil function (Wardle et al., 2004). However, there are few skilled nematode taxonomists remaining, primarily due to retirement without replacement and young scientist's lack of attention in classical Taxonomy (Coomans, 2002).

Accurate identification of nematode is very important. Identification techniques are essential for plant nematode introduction, distribution and spread of any control programs, including biological, cultural, chemical, or physical control. Detection and identification of nematodes are the first step in checking their spread and controlling them. This may result in economic savings of great magnitude (Siddiqi, 1997).

The aim of this study is necessary to conduct studies on nematodes that ıs important in the field of plant protection and soil health and determine the distribution of plant parasitic nematodes in agriculture areas also determining the diversity and distribution of free-living, predacious and omnivorous nematode fauna, their identification, because of the Lack of a comprehensive study on the distribution of species in north part of Iraq and in Turkey, It aimed to investigate the effects of region conditions, geographical differences, and different types of ecosystems and soil properties on nematodes biodiversity.

2. LETARATURE REVIEW

2.1. Taxonomy

Nematodes are unsegmented, pseudocoelomate worm-like animals, commonly described as threadlike or filiform, a characteristic reflected the taxon name name (Greek, nema= thread) and its nominative plural nemata (Perry and Moens, 2013).

Khlil and Badaway (2012) assumed that Nematodes make up the majority of the Metazoa on earth, which make them the largest species on the metazoa chart. Nematodes could be aquatic, free-living or parasites of plants and animals.

Nematodes are considered to be a portion of virtually all ecosystems for their roles as bacterivores, herbivores (Briar, 2007). Nematodes are inhabited of terrestrial, marine and freshwater ecosystems. They can make their internal ground within these unsuspicious organisms. They can evolve countless of survival strategies, allowing them to adapt to all environments to increase their chances of survival, especially under hostile conditions (Sedky, 2013).

Nematoda has recently been separated into two classes, namely Adenophorea and Secernente mainly based on some molecular and morphological characters (pozio et al., 2009). The phylum Nematoda is well defined and separated from all other organisms making them extremely unique. The phylum nematode is a ecologyically, taxonomically and geographically diverse group (Inglis, 1983) and is containing about 40,000 to 10,000,000 species (Yeates and Boag, 2006).

Wilson and Khakouli-Duarte (2009) believed that Nematodes are an important focus for taxonomic, physiological, ecological and molecular research because of their role in agricultural and natural ecosystems, and for molecular studies and for their usefulness as bio indicator.

Lambshead (1993) stated that the number of nematode species in marine habitats could be as high as one hundred million. On the other hand, only 26,646 species of plant parasitic nematodes have been described, nematodes are considered one of the most difficult organisms to identify due to their small size, similarities in morphology, limited number of distinguishable taxonomic characters and overlapping morphometric measurements (Oliveira et al., 2011).

Taxonomy and its applicability as a tool for species identification competent, based exclusively on morphological evidence, can be as reliable as any other modern biochemical, behavioral or molecular methods. Whether a certain morphological distinguished group of nematodes would represent a species is a difficult issue to discuss. With all its limitations, morphology is as good as any other taxonomic tools in species identification. However, its optimal use in microscopic organisms such as nematodes requires more technical (microscopic) and taxonomic expertise than needed for other macroscopic groups (Abebe et al., 2013).

Most recently, De Ley and Blaxter (2002) published a temporary system for nematode classification based on evidence of molecular. They placed Nematoda into two classes called Enoplea and Chromadorea and twenty one orders. As De Ley and Blaxter (2002) indicated that their classification was truer than ever before, generally, it is known that systematic of nematode is inherently prone to instability and controversy (Zhao, 2006).

Nematode classification had a turbulent history because of not only as a result of wider developments in animal systematic, but also because of the perspectives and unique skills of the relatively few dermatologists who output comprehensive classifications. Most of these classifications were depended on few morphological characters observed by light microscopy. Classification of Lorenzen was mostly built by individual effort as a specialist in free-living aquatic nematodes and some of the most varied groups of free-living nematodes (Moens et al., 2006). Lorenzen (1994) constructed a system where phylogenetic deductions and assumptions were built and spelled out thoroughly for the first time.

Outline Classification of the Phylum Nematoda approach of molecular has legalized included views of phylum. Although results are matched with traditional relationships, however, they have so far not resolved uncertainty among marine groups. It is considered the Order Rhabditida is a monophyletic group equal with all of ‘Secernentea’ (Phasmidia) in many preceding classifications (Blaxter, 1998). One of the mostly accepted nematode classifications was done by De Ley and Blaxter (2004).

2.2. Biodiversity

Nematodes are most likely constituted as one of the most varied metazoan phyla in species richness, most of which still are not identified (Ahmed et al., 2015). Nematodes are one of the abundant groups in the animal kingdom. The phylum Nematoda comprises the classes Adenophorea and Secernentea. In these two classes numerous species are free-living; some are parasites of animal and plant. Parasitic nematodes, belonging to 256 families, have usually larger size, longer life span and more eggs production than free-living nematodes (Sobecka, 2012).

Nematodes comprise 80% of the multicellular animal's abundance in terrestrial ecosystems and more than 90% of their presence in the deep sea. The phylum is characterized by distinct feeding type and very high richness in number of species (Danovaro et al., 2008). Their sizes are small and their generation times are rapid making them an easy, quick adaptation to habitats, and local conditions. Therefore, they are so dominant in both diversity and abundance in meiofaunal communities. Even though the nematodes species richness is range from 1 to 100 million species, the number of described nematode species is currently estimated at about 24 000 in the world (Fonseca et al., 2010). The number of identified species of nematodes estimated from around 12,000 according to Hickman et al. (2004).

Brussaard, 1997 stated that there are more than 100 000 soil nematode species to be identified. Studies showed that a total of about 14,000 invertebrate, free-living and plant parasitic nematode species are recognized, accepted and described (Warwick et al., 1998). A related number of published names of species are regarded as valid species synonyms (Hugot et al., 2001). Poinar, (1983) indicated that the described species consist of approximately 3–10% of total species presents. Plant parasitic species are estimated to be about 10% of all species nematode. Pokharel, (2011) suggests that overall 50% of nematodes are free-living, 25% are marine or freshwater sediments, 15% are parasites of human or animals. Carugati et al., (2015) mentioned that marine free-living nematodes are anticipated to have species numbers, ranges from 61,000 to more than 100,000 species, but only 11,400 species including either free-living or parasitic appearance were completely described.

Nematodes can contain up to 10^8 individuals per square meter. The limitation of light microscopy in nematology is one of the reasons of discrepancy occurring between recognized and approximate richness of species in nematodes (Porazinska et al., 2009). For their identification to genus and family level, nematodes are being extracted from the soil by baermann and sieving systems (Young-Mathews et al., 2010).

Nematodes can be categorized into different trophic groups, which play an important role in soil by feeding on soil fauna like fungi, bacteria, cyanobacteria, plant roots, green algae, and other. It suggested that these trophic groups play very important roles in mediating soil nutrients and utilize function of soil society (Darby et al., 2007). They are ubiquitous and simultaneous and susceptible to variation of soil environment (Neher, 2001).

Biodiversity is measured on the basis of taxonomic variety, richness of species, variety of species, and functional diversity, reported number of nematodes in the soil varies among scientists, being very sensitive to soil disorder, Omnivore and predatory nematodes are abundant in natural areas than those in agriculturally unproductive fields (Sánchez-Moreno et al., 2008). Numerous studies stated that nematode multitude and diversity were affected by inorganic and organic fertilizers. Bacterivorous and Fungivorous nematodes populations were greater in soils improved with manure than that chemical fertilizer (Hu and Qi, 2010). Substrate texture and chemistry have a considerable effect on the genera and species existence in soils, but have insignificant and inconsistent their diversity (Rantalainen et al., 2005).

Studies of ecological and nematode diversity are usually limited to genus identifications level, since taxonomic surveys approach are hard in identifying all isolated species (De Ley et al., 2005). Next to their species richness, their ecological, all aquatic habitats and terrestrial and also their high amount of individuals become important part of nature (Floyd et al., 2002).

2.3. Morphology

Description of a nematode is not complete without the analysis of the species and deep information on its habitat and locality. The general appearance to the external structures was observed by scanning electron microscopy (SEM) (Decraemer and Backeljau, 2015). Evolved and developed from three primary germ layers called ectoderm, mesoderm and endoderm, nematodes are characteristically unsegmented, spindle shaped and bilaterally symmetrical (Ravichandra, 2008). Bogitsh et al. (2013) stated that nematode body are characterized by tapering at the ends and tube within the tube alimentary tract with the body wall. Nematode body is partially lined by mesoderm (Maggenti, 2012).

The basic body shapes of nematode are filiform with the boundary more or less truncated or attenuated. The body length varies from one millimeter to more than one meter. Sexual dimorphism makes female nematodes longer than males (Mulder et al, 2011), though, during developmental stages they might change their shape by losing worm like form. Most plant parasitic nematodes are microscopic ranging from 0.5 mm to 2.0 mm (Stirling et al., 1999). The body composed of an external cylinder made up a body wall, including the cuticle, epidermis or hypodermis and somatic musculature. On the other hand, internal cylinder contains digestive system, pseudocoelomic cavity filled with fluid and a number of other organs such as a nervous system and reproductive tracts (Haegeman, 2009).

Nematodes have more elastic, non-cellular layer called the cuticle (Yamaguti, 1963). The cuticle of nematodes is flexible, transparent and defensive consisting with fats and proteins. As their development progresses nematodes molt four times before reaching adulthood (Gelernter and Stowell, 2001). Numerous studies report that the function of cuticle is a multiple functional exoskeleton that a highly impermeable barrier between the individual and the environment. Cuticle in nematodes is critical and necessary for preserving of body shape, morphology and safety (Kramer et al., 1988; Johnstone et al., 1992). The cuticle of parasitic nematodes is generally smooth and posses diverse structures such as, bristles, striations, punctuations, papillae, spines, warts and ridges. The arrangements and positions of such structures may play an important role in nematode taxonomy (Cheng, 1964). The cuticles enclose also the stomodeum, proctodeum, excretory pore, and vagina. The surface of the cuticle is found to have a carbohydrate rich coat in free-living and parasitic nematodes (Blaxter et al, 1992). The mouth or oral opening in nematodes is generally terminal, may or may not be surrounded by lips and sensory organs. The mouth opens into a mouth cavity called buccal cavity or stoma. Plant parasitic nematodes usually contain a stylet, predatory nematodes have teeth like structures in stoma. This is followed by the esophagus (pharynx), intestine and rectum, which open to the exterior via anus. A cloaca formed by the vas deferens joining the rectum in the male. The anus and cloaca may positioned terminal or subterminal (open ventrally) depending on developmental stages and species (Lee, 2002).

The broad diversity of ingestion and food obtaining methods is depending on the digestive system structure, particularly pharynx and buccal cavity morphology. Feeding habit types of nematodes are included bacterial feeders, hyphal feeders, plant feeders, substrate ingesters, unicellular eukaryote feeders, carnivores, and animal parasites (Moens et al., 2004).

Plant parasitic nematodes maintain a mouth spear similar to a hypodermic needle called a stylet. Stylet is used to pierce plant cells to extract food, secrete metabolites and protein from plants during feeding. The stylet is linked to the esophagus then connected to the intestine (Lambert and Bekal, 2002).

Three distinguished types of stylet are found in plant parasitic nematodes; onchiostylet, odontostylet and stomatostylet. Onchiostylet is a curved, solid and needle-like tooth found in order Triplonchida (*Trichodorus* and *Paratrichodorus*). The odontostylet on the other hand is hollow and is much less distinct present in all Dorylaimids and in the genera *Xiphinema*, *Longidorus* and *Paralongidorus*. The stomatostylet, like the odontostylet, and is also hollow, present in nematodes belonging to the order Tylenchida. A stylet consists of three parts namely cone, shaft and basal knobs. Sylet shape and size is helpful in recognizing a particular taxon within the same order (Dela et al, 2003).

The nematode reproductive system is responsible for the production of new individuals to guarantee the survival of the species. In second stage juveniles of nematodes reproductive system is minute, but it grows rapidly and differentiates into either testes or ovaries after feeding begins (Eisenback, 1985). Nematodes have a complex reproductive structure and system. Many species would reproduce either by parthenogenesis (in lack of males) through only females (Paul, 2014), or by hermaphroditism (both ova and sperm from the ovotestis of the same individual). Nematodes typically are sexually dimorphic (amphimictic) with separate males and female sexes (Maggenti, 1991; Malakhov, 1994). Males usually have one or a couple of spicules used to aid in the transport of sperm to the females. Many species have a gubernaculums used to guide the spicule during copulation (Gardner, 2001). The reproductive system is tubular and is quite resembles to each other in both sexes. Male or female includes one or two tubular genital branches. The female genital system may compose of two usually opposed branches called didelphic or a single branch called monodelphic. In monodelphy, the posterior branch may be reduced to post-uterine sac or be entirely absent. In a reproductive structure of male, the single genital tube consists of a testis, vas deferens and seminal vesicle opening to the outside with the intestine via a common aperture called the cloaca. In a female reproductive structure, the single branch consists of an ovary (gonad), uterus (gonoduct), oviduct and a vagina. The vagina opens to the exterior via the vulva (Luc et al, 2005). Nevertheless perhaps there is a sperm storing structure called spermatheca. The reproductive system of male posses two testes (diorchic) opening into a vas deferens. A part of each testis or the anterior part of vas deferens may act as vesiculum seminalis. Single testis (monarchic) occurs after reduction of other testis posterior or anteriorly (Balian et al, 2008).

In most species the lateral alae form by overlapping of expanded of the hypodermal cords. Nematodes have a tubular organ system. Excretory, reproductive, alimentary systems histologically simple and lie freely within the body cavity. The nervous system is composed of a nerve ring surrounding the pharynx (Wharton, 2012), and connecting various ganglia via posteriorly and anteriorly running longitudinal nerves within hypodermis. Chemoreceptors or mechanoreceptors sensory structures such as papillae or setae are located on the anterior end of the body. In aquatic free-living nematode body may have numerous or few somatic sensillas in setiform or poriform (Abebe et al, 2008).

The nematoda has two subclasses namely Adenophorea and Secernentea. In Adenophorea, caudal alea are present or absent in males, secretory excretory pore not lined terminally with cuticle, phasmids are absent, epidermal glands are present. Additionally, a cylindrical pharynx or pharyngeal glands open in the psuedocoelom forming a stichosome or trophosome and egg may hatch in utero and first stage larvae. In Secernentea, however, caudal alea are mostly present in males, and secretory excretory pore terminally lined with cuticle, phasmids are present, epidermal glands are absent and pharynx is fully developed (Lee, 2002). The secretory - excretory system may help in locomotion and osmoregulation and may have a role in the secretion of nitrogen in the form of ammonia (Balian et al, 2008).

2.4. Life cycle

After embryogenesis, nematodes undergo four developmental stages called juveniles (J1–J4) separated by molts. Most of nematodes would spend at least one part of their life with other organism to become an obligate parasite (Rödelsperger et al., 2013).

Yanong (2011) stated that the life cycle of nematodes may vary depending on the species. Nematodes general life cycle composed of six stages; the egg (or embryo), four juvenile stages (J1, J2, J3, J4) and the adult. Plant nematologists name the pre-adult or immature stage juveniles, whereas animal helminthologists name them larvae. The immature stages of nematodes mostly resemble to adults with the exception of those having sexual dimorphism.

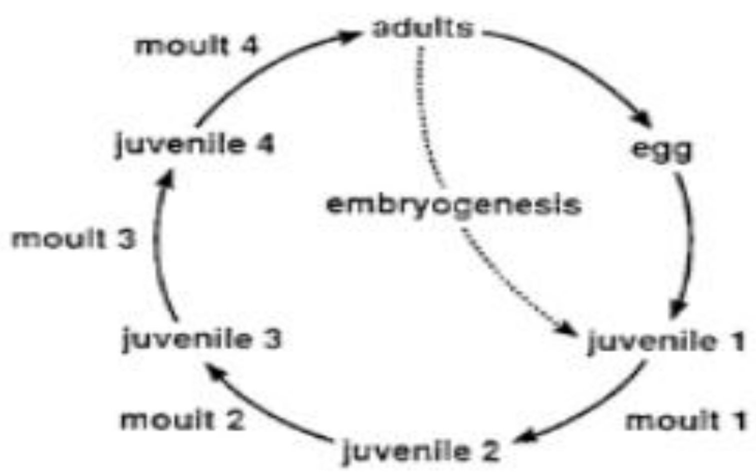

Figure 2.4. Life cycle of nematode (O'Brien and Stirling, 1991).

Kimenju et al. (2004) noticed that the nematodes may lay eggs individually or stuck together in a mass. For instance, root-knot nematode (*Meloidogyne* spp.) females deposit their eggs as mass inside a gelatinous matrix which secreted by the secretory excretory pore. On the other hands, cyst nematode (*Heterodera* spp.) females would serve their body (cuticle) as egg sacs (cyst) after death to protect them from natural enemies and desiccation. The shape of eggs is oval without plugs, spines, or excrescences. Mostly, first molt usually occurs in the egg and the second-stage juvenile hatches and looks for food or host.

In some nematodes, such *Xiphinema* species, the life cycles are reduced to only three moults. This is because of a phenomenon called epogenesis meaning the maturation of gametes before complete body growth. Epogenesis is known to be very rare in parthenogenetic organisms (Perry and Moens, 2013). In Dorylaimida and Rhabditida, first-stage juveniles (J1), in Tylenchida, Aphelenchida the second stage juveniles (J2) hatch from the egg (Manzanilla-López and Hunt 2004). Numerous reports illustrate that in some cases, such in some animal-parasitic nematodes, two molts may occur within the egg (Gaugler and Bilgrami, 2004; Gibson et al., 2014; Smyth and Wakelin, 1994).

Page and Johnstone (2007) stated that the molting is divided into three subdivisions called lethargus, apolysis and ecdysis. Lethargus is described by a progressive decrease in feeding and general activity, ensuring segregation of the old cuticle. Apolysis takes place when nematode rotates rapidly around its longitudinal axis and lose the old cuticle. In ecdysis is the shedding and emerging the body from the old cuticle finalizing the process of molting.

Some free living nematodes can develop effective survival strategy to withstand unfavorable conditions during their life time. Those forms can be called as robust dauer larvae that are resistant to various environmental stresses. On the other hand not only animal parasites but olso plant parasites have a specialized stage for infestation called infective juveniles (Sommer and Ogawa 2011). These stages also are resistant to extreme temperatures, desiccation and starvation. They are in similar type of the dauer larvae of free-living nematodes formed under unfavorable environmental conditions (Mitreva et al., 2013). Dauer stage that is developed under unfavourable environment is an alternative third stage, and is specialized for dispersal and survival (Houthoofd et al., 2002). Since dauers larvae are non feeding, they have to metabolize and store macronutrients in the pharynx or the buccal cavity (Wolkow and Hall 2011). Some nematodes species hold shedding cuticles from molting, as sheaths to aid survival (Perry et al., 2012).

The dauer larvae's metabolic activity is reduced; natural body openings such as mouth and rectum are closed making nematode cuticle resistant and strengthened to chemicals. Life cycles of nematodes ranges from less than 5 days to more than a year depending on species, substrate quality and temperature, humidity, food competitions etc. Generations of most plant parasitic nematodes in soil overlap because of the existing the penetration throughout the growth of the plant (Ciancio and Mukerji, 2007).

Nematodes usually are amphimictic by sustaining separate males and females. Many species males may be absent and reproduction may occur parthenogenetically (*Meloidogn*e spp). In some cases, as is in entomopathogenic *Heterorhabditis*, reproduction is taken place by hermaphroditism (Balian et al., 2008). In these cases females are usually oviparous or some groups are ovoviviparous. In oviparous groups, produced eggs undergo embryonic development and hatch in exterior part of the female body. In ovoviviparous groups, however, produced eggs would undergo embryonic development within the female body and hatch before being released (Thorp and Covich 2009). In some cases, hatching takes place inside the female body, a process known as matricidal hatching or *endotokia matricida* (Luc et al, 1979). A phenomenon of eggs hatching into larvae inside the female body was observed among plant-parasitic nematodes and parasites of both vertebrates and invertebrates but rarely observed among free-living and marine nematodes (Grzelak and Kotwicki 2014). It was reported that ovoviviparity could be inducing in species that normally reproducing by pollutants for instance sulphur dioxide (Walker and Tsui, 1968).

Some plant parasitic nematode show sexual dimorphism indicating having males and females in different body shapes. Females of such groups lose their worm-like shape as they mature, becoming expand and pear, lemon or kidney shaped or spherical as adults (Coyne et al., 2007). Rare males, however, stay as worm shape for their whole life. Nematode life cycle can be completed very rapidly when conditions are optimum. Some cases, some nematode groups can produce a generation within 5 to 7 days, depending on climatic conditions like temperature, humidity etc. (Glaser et al., 1940).

The effect of temperature on nematodes varies. For instance, generation time may shorten and survival of eggs and juveniles may greatly reduce at high temperatures (usually greater than 30 °C). Temperature may effect on the sex ratios with favouring of males. Consequently, even generation time is shorter; the size of the developing population may be smaller. Studies showed that the population response is likely the most suitable measure of optimum temperatures in nematology (Anderson and Coleman, 1982).

2.5. Importance of nematodes

Nematodes could be parasitic, free-living or predaceous. A group of parasitic species is leading to important diseases in plants, humans and animals. Other species are becoming beneficial organisms causing significant decrease in past populations by attacking and causing death or debilitating their hosts (Usta, 2013). There is a group of beneficial nematodes that are used in controlling insect pests of plants, called entomopathogenic nematodes. These groups of nematodes are pathogenic to only the plants associated insects (Dreves, 2013). These nematodes are present in the soil of wherever plants are grown. Entomopathogenic nematodes attribute a great deal of being utilized in the biological control arena as biological control agents (Edelduok and Umana, 2015).

Free-living nematodes have an essential function in marine and soil food webs, by impacting the microbial communities' structure and connecting primary productions (Majdi and Traunspurger, 2015). Free-living marine nematodes are important and abundant members of the meiobenthos; feed on various materials such as algae, fungi, living tissues, small animals, dead organisms and fecal matter. Nevertheless, free ling nematodes have a big role in the process of decomposition by assisting the nutrients recycling in marine life that is susceptible to environment changes (Ayanda et al., 2010).

Parasitic nematodes cause many diseases in humans, animals and plants, resulting an extensive harm in veterinary animals, humans and lead serious losses in agricultural crops (Mitreva et al., 2007). However, they either, primarily, cause direct damage to their hosts or, secondarily, act as vectors of other pathogens like virus, fungus and etc. Nematode feeding mostly could open to doors for other infestation by secondary pathogens (Nicol et al., 2011). Creation open wounds by nematodes provides an ingress of broad range of plant-pathogenic bacteria and fungi to their host (Sethuraman and Naidu, 2008) Insecticidal or entomopathogenic nematodes are mainly belong to the genera Heterorhabditis, Steinernema and Mermithidae (Sree and Varma, 2015).

Nematodes in soil are very beneficial to transforming the organic matter into organic nutrients and minerals which is taken by consumers such as plants and other organisms in the food web. These roles give tremendous positive effect on plant growth, consequently, crop production (Ingham et al., 1985). There are many nematodes species feed on bacteria and fungi in the soil, some others prey upon others called predatory or omnivorous nematodes (Veen et al., 2010).

Nematodes play a substantial role in the plant nutrient mineralization and organic matter decomposition. The excess nitrogen is excreted as ammonia by nematodes as a result of bacterial feeding and assimilating more than needed of nitrogen (Barker and Koenning, 1998). When bacteria or fungi ingested by nematodes, excessive ammonium (NH_4^+) are released (Hoorman, 2011). Contributed nitrogen mineralization for conventional and integrated farming systems by nematodes are 8% and 19% for bacterial feeding and predatory nematodes, respectively (Holgado and Magnusson, 2005).

Nematodes also support the spread of fungi and bacteria around the roots and over the soil by carrying them either with their body or within their digestive systems (Prasad, 2014).

Plant-parasitic nematodes can be categorized into three groups as entoprasites, ektoparasites, and semi endo/ekto parasites. Endoparasitic nematodes nurturing and spending their life within the tissue of roots, tubers, buds, seeds, according to Guerena, (2006). Ectoparasites nurturing and staying outside of the cell of plant, semi-endo or semi-ecto parasitic has a feeding habit with a part body staying outside anda part inside of the surface of plant (Pokharel, 2011). Williamson, (1999) believed that many species belonging to family Heteroderidae are endoparasites causing the most economically damage in the world agriculture. These families include cyst nematodes comprised two genera *Heterodera* and *Globodera* and the genus *Meloidogyne* spp. (root-knot nematodes). Earles et al., (1998) indicated that direct feeding by nematodes could affectively damage a plants nutrients and water uptake causing impairment the plant.

Nematodes also can act as soil ecological bio-indicator in numerous agricultural systems due to their ecological characteristics such as taxonomical, abundance and functional diversities (Sánchez-Moreno et al., 2014). However, nematodes in ecological studies remain neglected largely due probably to the difficulties in identification and etc. (Foucher and Wilson, 2002).

3. MATERIAL AND METHODS

3.1. Study of Area

The study was conducted to determine the biodiversity of terrestrial nematodes in agricultural and analysis of their community. Soil samples were collected under comparable climatic conditions from agricultural field cultivated with different crops in 2014 and 2015. The study samples were collected from olive, grapes and mixed fruits growing areas of the two countries, Iraq and Turkey.

A total of 250 samples, 125 for each country were collected from crops mentioned above. The study area from different fields of Kahramanmaraş, Turkey laid between 36°52'E longitudes and 37°30'N latitudes with mean elevation 687 m. The climate of the region was temperate with a temperature ranging from 3.8°C in February to 28.2°C in August. The study area from different fields of Duhok, North Iraq laid between 43°01'E longitude and 36°50'N latitudes with an elevation of ranging from 300 to 1300 m. The climate of the Duhok was of semi-arid, designated as continental and subtropical. The average temperature in this part of Iraq did not exceed 38 °C (Figure 3.1). The locations of soil sampling were recorded by Global Positioning System (GPS) for each country and are shown in the appendix.

3.2. Preparation of Soil Samples

3.2.1. Field survey

In this study, a total of 250 soil samples were collected from the agricultural fields of olive, grapes and mixed fruits of two countries, Turkey and Iraq. The soil samples were taken from parallel to the body falling shadow of a tree by a sampling tube or shovel. Areas with moist enough were priority for soil sampling in all three crops, in both countries.

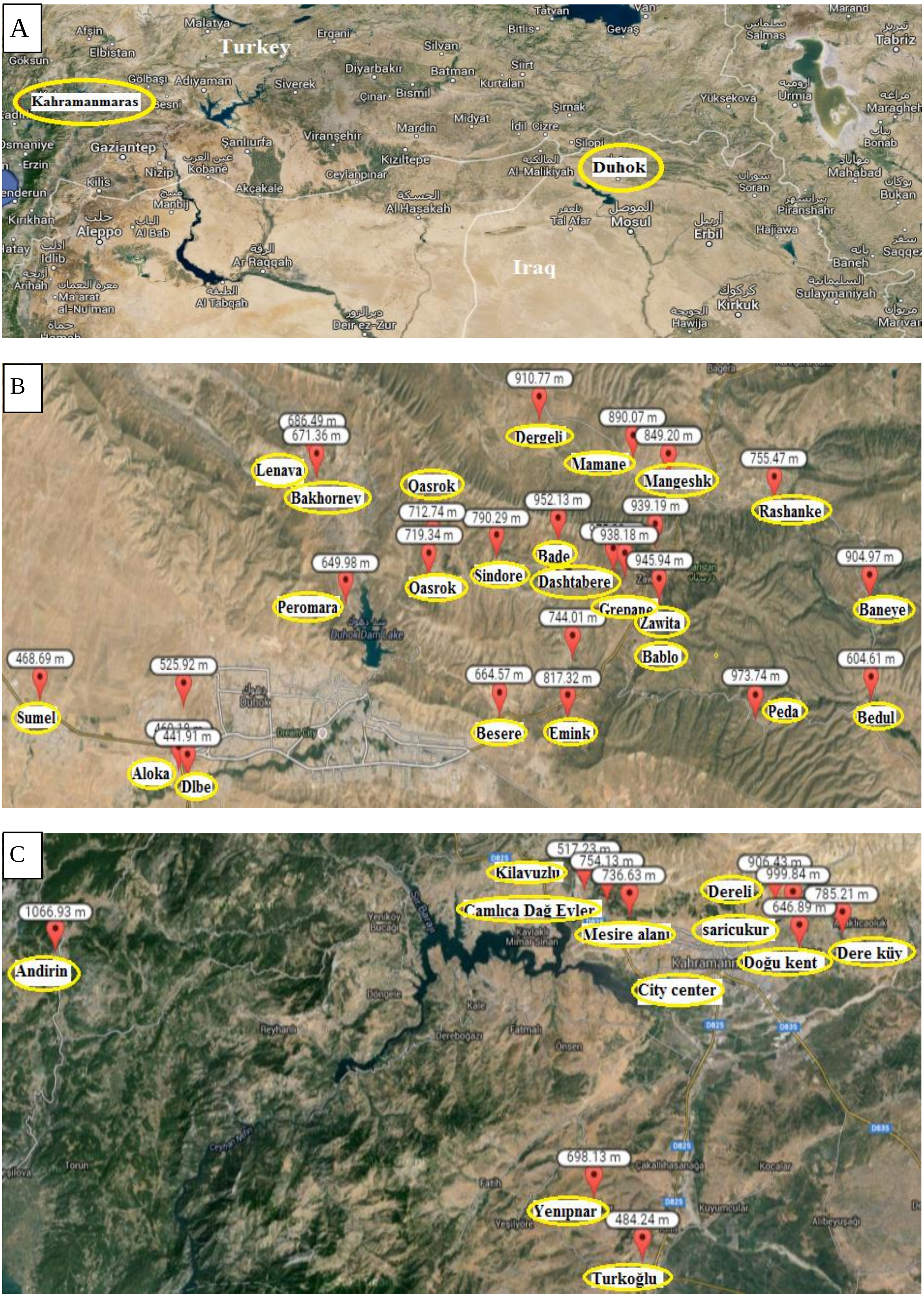

Figure 3.1. A view of soil sampling areas of (A) both countries, North of Iraq and South of Turkey (B) North of Iraq and (C) South of Turkey, individually (Google Earth Ins).

First top 5 cm layer of each soil sample was disposed considering excessive sunlight exposure could have lowered the number of live nematodes. All soil samples were taken in a soil layer of 5 to 35 cm in depth. Sampling was done homogically, assuring that samples taken would represent the entire field. Each sample taken was consisted of 6 sub-samples (cores) from multiple locations in equal intervals with a zig zag pattern. The soil volume for each soil sample was brought in approximately 500 cm^3 and placed into a polyethylene bag to avoid exposure to light and high temperatures. Then they were labeled with information such as crop type, field size and the date of sampling. After sampling, all samples were placed and kept in a ice chest and brought to the lab for further analysis. For nematodes extraction (Figure 3.2), modified Bearmann Funnel procedure was followed as outlined by Barker and Campbell, (1981)

3.2.2. Extraction producers of nematodes from the soil

Nematodes cannot be detected or quantified without being extracted from the soil and identified under a microscope. Sampling and extracting of nematodes serves two purposes; to predict a future problem and to diagnosis a current problem. Modified Baermann producers were used to extract live nematodes from the soil. Extracted nematodes were identified to genus and relative abundance was estimated in each sample by a light microscope. The technique and instrument used in the study were considered simple and had higher collection efficiency.

3.2.2.1. Baermann system

Bearmann technique sustains some advantages and disadvantages in the nematode extraction process. As disadvantages; the method is not quantitatively reliable for slow and non-moving nematodes. Recovering of a clean live nematode sample in this technique is limited by fine soil particles that precipitated with nematodes. Sieves are needed to concentrate nematodes; lack of aeration can be also a problem in the process. As advantages, however; the procedure is relatively fast, extremely cheap, materials used are readily available, yielding relatively large numbers of live and active nematode from soil and plant material in a clear suspension. Since the original Baermann Funnel Method used funnels and funnel holders that requires additional space in the laboratory, the Modified Baermann Method was preferred. Modified Baermann Method uses the same principles of nematode extraction, but materials that can be stacked and more easily handled than funnels

Figure 3.2. The sampling process in the field. Collecting soil samples from A) olive trees B) grape C) sampling by shovel D) sampling by a sampling tube E) mixing 6 sub samples and putted in bag F) polyethylene bags labelling G) Collected samples of a particular area to be taken to laboratory.

3.2.2.1.1. Materials required

The materials needed for the modified Bearmann process were; 2 L in size trays for precipitation the nematode and separate them from the soil then collecting nematodes at the bottom of it. A wire mesh consisted of two rings of PVC pipe with a window screen material (hardware cloth) glued between them, double thickness two-ply Kleenex or tissue glass beakers of approximately 100 ml and 500 ml, squeeze bottle, 500 mesh sieve, and 50-ml in size Falcon centrifuge tubes (Figure 3.3.). Room temperature in the laboratory was maintained at approximately 25°C, and refrigerators used with temperatures of approximately 5 ±1°C.

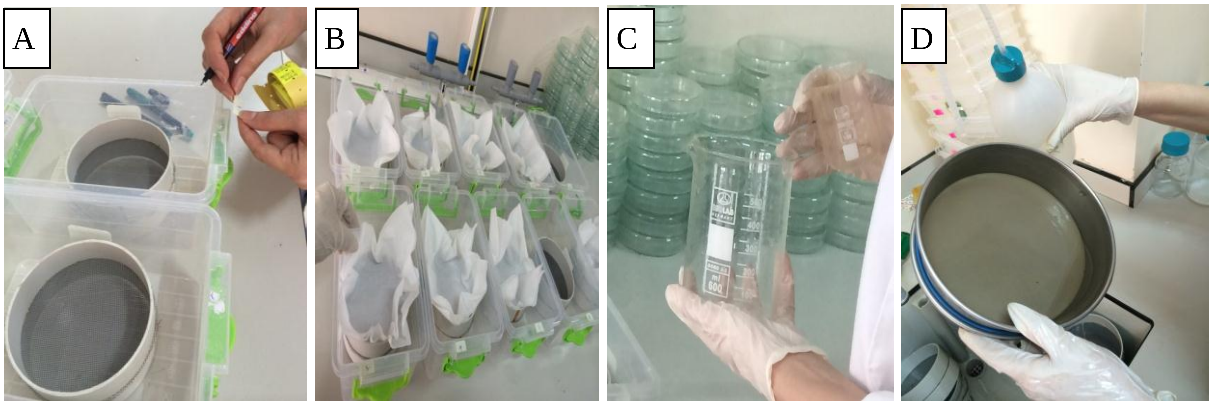

Figure 3.3. A view of Baermann system settings A) Baermann trays with a wire mesh B) tissue paper placed in wire mesh and Baermann trays and C) A glass beaker D) A Squeeze bottle and a 500 mesh sieve.

3.2.2.1.2. Method

A sub sample of each soil sample taken from the field was measured by 100 ml beaker and placed on a double tissue paper superimposed on a wire mesh in the tray. It was ensured that the tissue had a diameter greater than the outer diameter of the tray. Then water was added to the dish until it slightly covers the wire mesh and soil filled tissue paper. The edge of tissue paper was curved toward the inside to prevent soil falling out of the wire mesh. After setting the system, more water added to the trays if needed. The dish should be placed on a level surface for even nematode extraction, allowing enough time for the nematodes to migrate from the wire mesh to the water containing the dish. After 10 days, the screen was removed slowly and gently from the dish, avoiding the breaking the paper tissue and releasing soil particles into the water. The extraction process of nematodes was finalized by sieving the nematode containing suspension with a 500 mesh opening sieve and obtaining collected nematodes (Spaull and Braithwaite, 1979) (Figure 3.4)

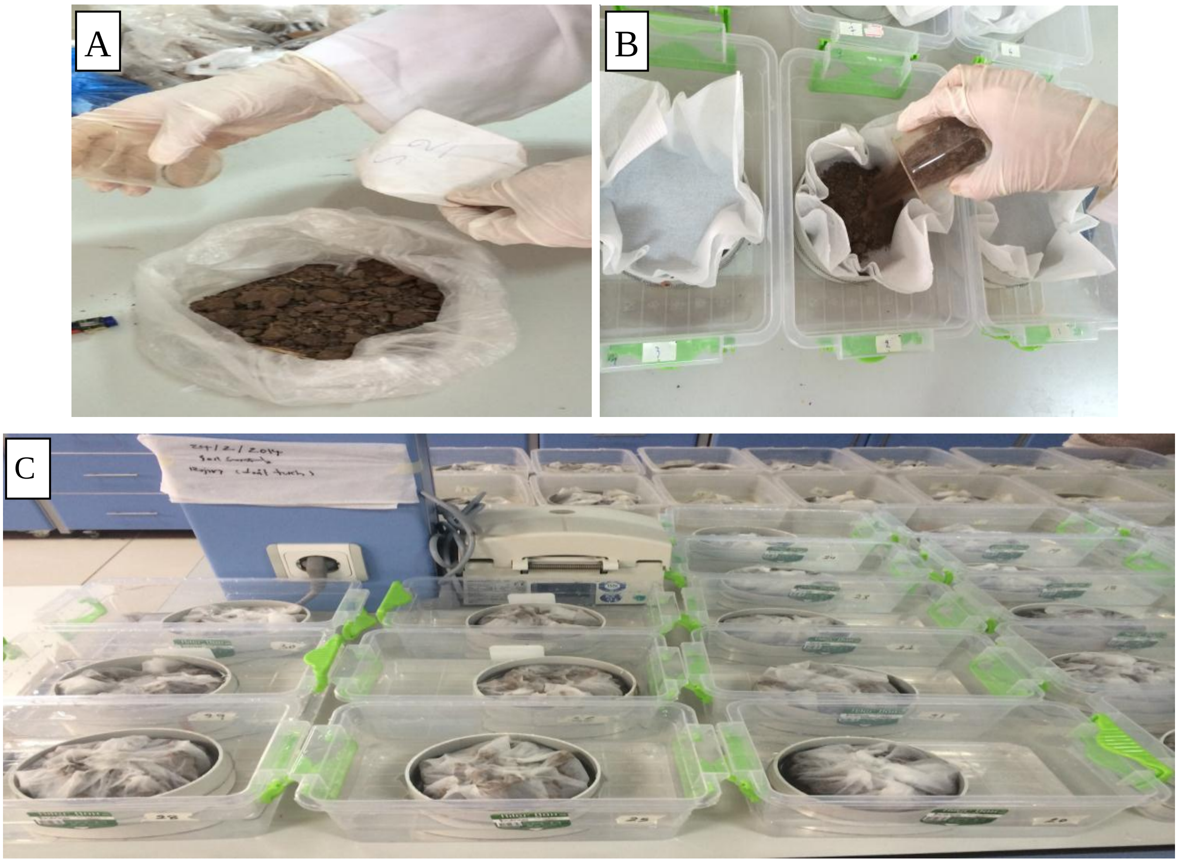

Figure 3.4. A view of Baermann system A) 100 ml beaker and the soil sample B) Placing soil in the Baernann trays C) A completed view of arranged Baermann method.

3.2.2.2. Sieving

In order to harvest nematodes wire mesh was slowly and gently removed from the dish. After a large proportion of active nematodes available in the soil were moved down through the tissue and gathered into the bottom of the tray for 10 days, they were harvested from the bottom of the tray poured out over a fine sieve (mesh 25 μm) and were washed out into a falcon tube, 50 ml in size, by squeeze bottle. Some of the nematodes found in the nematode sample were prepared for imaging and kept for further processing (Kimenju et al., 2004) (Figure 3.5)

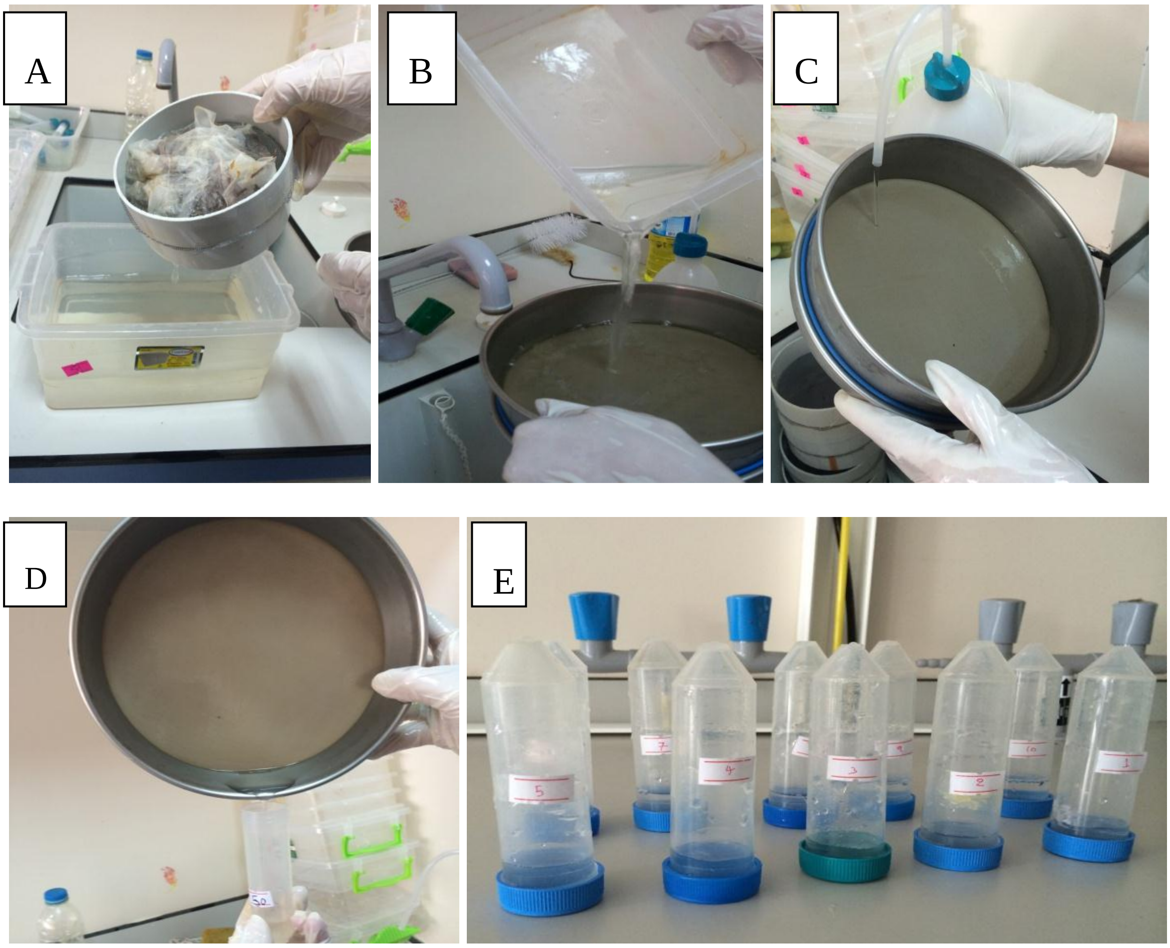

Figure 3.5. A view of sieving process A) Removing wire mesh with soil from the water B) pouring nematode containing water through 25 µm mesh sieve C) Washing out for collection of nematodes D) Collecting the nematodes into a Falcon tube E) A view of tubes containing nematodes.

3.3. Identification

3.3.1. Microscopic observation

Nematodes identification is primarily based on morphological characters and morphometric measurements. Because males are absent or rare for many species, identification is most often based on the adult female, individually. Characteristics of juvenile stages may be useful in identification of some genera and species. Most nematodes are microscopic and not visible to the naked eye. Some morphological traits are readily observed using the low magnification of 30 to 60X of a stereoscopic microscope. These include the overall size and shape of the nematode, presence and shape of the stylet and stylet knobs, stage of development, juvenile vs. Adult. Vulva is present in the female, therefore, the absence of this character indicates that the specimen is in the pre-adult stage, juvenile. In females, the vulval position, the tail shape (rounded, conical, or filiform) and other morphological characters can only be seen at higher magnification with a compound microscope (Bridge and Starr, 2007).

Nematodes collected from each sample were identified to the genus level by means of an inverted compound microscope, Lx400 LABOMED. Additionally, all identified nematodes were counted to record the nematode density for each group or genus. Mostly alive nematodes were subjected to the density and identification study. During the study, nematodes were observed with different binocular lenses such as 40, 60, or sometimes up to 100X magnifications to observe more define morphological features**.** If the total number of individuals were less than 100, all of the nematodes were subjected to the identification. The nematodes were assigned to the following trophic groups characterized by feeding habits: bacteriovuores (BF), fungivores (FF), plant parasites (PP) and omnivores or predators (OP) (Yeates et al., 1993).

Under the microscope particular live or freshly killed nematodes were gathered in a small dish filled with water, before they were mounted on slides. The samples were examined by trained taxonomists microscopically and identified using keys based on morphological details (Fortuner, 1988). The following analyses were performed on each individual nematode (Figure 3.6).

Figure 3.6. Identification process of nematodes under microscope with an aid of computer software.

Figure 3.7. Microscopic view of some plant parasitic nematodes found in the soil A) *Pratylenchus* spp. B) *Eudorylaimus* spp. C) *Helicotylenchus* spp.

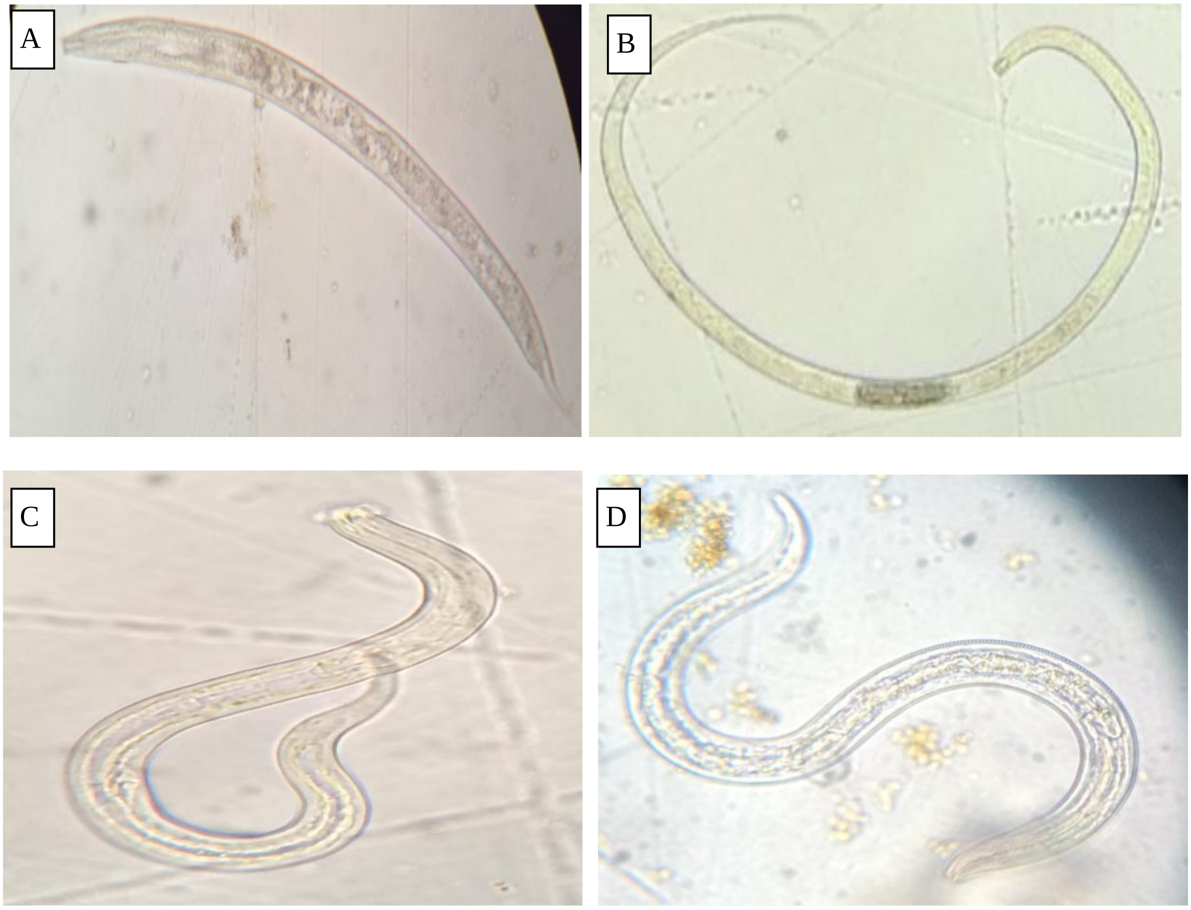

Figure 3.7. Microscopic view of some free living nematodes found in the soil samples A) *Rhabditis* spp. B) *Mononchus* spp. C) *Wilsonema* spp.and D) *Cephalobus* spp.

4. RESULTS AND DISCUSSION

4.1. Results

The biodiversity and nematodes population for two different countries; North of Iraq and South of Turkey were studied from 2014 to 2015. Nematode abundances were expressed as total number of individuals extracted from 100 cm^3 of sub soil sample for each crop of each location in relative country regions, separately. Overall, 32 genus of nematodes were identified from both countries. Nematodes of each sample were calculated similar to the concept proposed by (Yeates et al., 1993). Soil nematodes occupy different trophic levels of soil food web and they are easily associated with their food sources by examining the morphology of their mouth parts .They are often divided into four trophic groups as bacterial feeding (bacterivores), fungal feeding (fungivores), nematodes praying nematodes (Predacious) and multiple type food such as on plants, fungi, bacteria and other nematodes all together feeding nematodes (omnivores).

The total number of plant parasitic nematodes for three multi year crops in both countries is shown in Table 1. The total number of plant parasitic nematodes found in all three crops was greater in Turkey than those of Iraq except for Grapes. The total number of plant parasitic nematodes found in olive growing areas was 2378 belonging to 12 genera and 786 belonging to 9 genera for Turkey and Iraq, respectively. Grapes growing areas of Iraq contained greater number of parasitic nematodes (2253) than those of Turkey (985). Number of plant parasitic nematodes found in mixed fruits was, however, differed significantly between two countries. The number of parasitic nematodes in mixed fruits was 1503 belonging to 11 genera and 527 belonging to 9 genera for Turkey and Iraq, respectively (Table 1).

Total number of bacteriovore and fungivore together as free living nematodes identified in all three crops; olive, grape and mixed fruits from southern Turkey and northern Iraq are shown in Table 2. The numbers of nematodes among crops within the same country and between countries within the same crops were varied. Total of 3123 free living nematodes belonging to 15 genera were found in olive growing areas of Turkey as compared to total of 1053 nematode belonging to 13 genera in the same crop of Iraq. On the other hand, grape in Iraq maintained greater number of nematodes (3710) than those of Iraq (1442). The soil samples taken from mixed fruits of both countries showed greater differences in their free living nematode numbers. Turkey sustained total of 2023 free living nematodes as compared 785 nematodes found in Iraq (Table 2).

Total number of predacious nematodes and their belonging genera found in soil of three crops from two different countries, South of Turkey and North of Iraq are shown in Table 3. The highest and the lowest number of predacious nematodes among all crops from both countries were found in grape growing areas of Iraq (865) and mixed fruits of Iraq again (163), respectively.

Total number of identified omnivorous nematodes and belonging genera in soil samples taken from south of Turkey and north of Iraq shown in Table 4. Numbers of total identified omnivorous nematodes found in grape of Iraq were significantly greater (572) than those of olive (157) and mixed fruits (132) of the same country. Nevertheless, the numbers of total identified omnivorous nematodes found in grape of Turkey were the lowest (322) as compared to those of olive (594) and mixed fruits (565) of the same country (Table 4).

Table 1. Total number of plant parasitic nematodes and belonging genera found in 100 cm^3 soil sample taken from Olive, Grape and Mixed Fruits from South of Turkey and North of Iraq in 2014-2015.

Crops	South of Turkey		North of Iraq	
	Number of nematodes	Number of genera	Number of nematodes	Number of genera
Olive	2378	12	786	9
Grape	985	12	2253	10
Mixed fruits	1503	11	527	9

Table 2. Total number of free living nematodes (bacterivores and fungivores) and belonging genera found in 100 cm^3 soil sample taken from Olive Grape and Mixed Fruits from South of Turkey and north of Iraq in 2014-2015.

Crops	South of Turkey		North of Iraq	
	Number of nematode	Number of genera	Number of nematodes	Number of genera
Olive	3123	15	1053	13
Grape	1442	14	3710	15
Mixed Fruits	2023	15	785	13

Table 3. Total number of predacious nematodes and belonging genera found in 100 cm^3 soil sample taken from Olive Grape and Mixed Fruits from South of Turkey and north of Iraq in 2014-2015.

Crops	South of Turkey		North of Iraq	
	Number of nematodes	Number of genera	Number of nematodes	Number of genera
Olive	587	6	173	5
Grape	319	6	865	5
Mixed fruits	542	5	163	5

Table 4. Total number of omnivorous nematodes and belonging genera found in 100 cm^3 soil sample taken from Olive Grape Mixed Fruits from South of Turkey and north of Iraq in 2014-2015

Crops	South of Turkey		North of Iraq	
	Number of nematodes	Number of genera	Number of nematodes	Number of genera
Olive	594	6	157	5
Grape	322	6	572	3
Mixed Fruits	565	6	132	4

Details of total numbers and genera of all plant parasitic, free living, predator and omnivorous nematodes found in the soil samples taken from south of Turkey and north of Iraq in 2014-2015 are listed in separate tables below. The relative abundance of all nematodes given in all tables was based on 100 cm^3 sub soil samples.

A cumulative total of 32 genera were observed from soil samples of both countries from all three crops. In Turkey, a total of 56, 34, and 35 soil samples were collected for olive, grapes and mixed fruits growing areas, respectively.

Eleven plant parasitic nematodes genera identified from soil samples collected from olive, grapes field were *Aphelenchus* spp. *Aphelenchoides* spp. *Pratylenchus* spp. *Paratylenhus* spp. *Tylenchus* spp. *Ditylenchus* spp. *Xiphenema* spp. *Helicotylenchus* spp. *Hemicycliophora* spp. *Meloidogyne* spp. and *Filenchus* spp. (Table 5, 6). Soil samples of mixed fruits sustained the same genera found in the other crops except for the genus *Hemicycliophora* spp. The latter genus was not found in mixed fruit growing areas (Table 7). Even though there was not reported in the tables there was an additional nematode genus called *Criconema* (ring nematode) in south part of Iraq. Only some individual nematode belonging to these genera were found.

Total of 15 free living nematode genera were identified from soil samples of olive. Of which, *Monhystera* spp. *Wilsonema* spp. *Rhabditis* spp. *Acrolobus* spp. *Acrobeles* spp. *Chiloplacus* spp. *Cephalobus* spp. *Eucephalobus* spp. *Amphidelus* spp. *Cervidellus* spp. and *Panagrolaimus* spp.), were bacterivorous, *Aphelenchus* app. *Aphelenchoides* spp. *Tylenchus* spp. and *Ditylenchus* spp. were fungivorous nematodes. The latter four genus were also regarded as plant parasites (Table 8). Soil samples from grapes maintain the same result with those of olive except for the genus *cervidelus* spp., which was not found in any grapes soil samples (Table 9). The results of identified genera from mixed fruits were the same as those of olive (Table 10).

Six genera of predacious nematodes detected in olive samples were *Labronema* app. *Eudorylaimus* spp. *Discolaimus* spp. *Aprocelaimus* spp. *Mononchus* spp. and *Sienura* spp. It can be clearly seen in Table 11 and 12 that similar results were observed from grapes growing areas as well. The nematode genera diagnosed from mixed fruits was similar to the genera also found in olive and grape soil samples with the exception of lacking *sienura* spp. (Table 13).

Furthermore, six genera of omnivorous nematodes from olive soil samples were existed including *Labronema* spp. *Eudorylaimus* spp. *Ecumenicus* spp. (also considered predacious nematode), *Aprocelaimus* spp. *Mesodorylaimus* spp. and *Dorylaimus* spp.) (Table. 14). These results were resembled to those of grapes and mixed fruits soil samples (Table 15, 16) with the exception of lacking *Mesodorylaimus* in grapes.

Table 5. The number of plant parasitic nematodes found in olive orchards from south part of Turkey in 2014-2015.

Sample Code	Plant Parasitic Nematodes									
	Aphelenchus	*Aphelenchoides*	*Pratylenchus*	*Paratylenchus*	*Tylenchus*	*Ditylenchus*	*Xi phenema*	*Helicotylenchus*	*Hemicycliophora*	*Meloidogyne*	*Filenchus*
O-TKAY1	2	2	-	-	-	-	-	-	-	-	-
O-TKAB9	-	1	-	-	-	-	-	-	-	-	-
O-TKAK11	2	-	-	-	-	-	-	-	1	-	-
O-TKAK15	-	-	-	3	-	5	-	-	-	-	-
O-TKAK18	-	1	-	-	-	-	-	-	-	-	-
O-TKAK19	4	-	-	-	-	1	-	-	-	-	-
O-TKT21	4	3	-	-		-	-	-	-	-	-
O-TKT23	7	-	-	-	4	1	-	-	-	-	-
O-TKT26	3	12	-	-	14	-	-	-	-	-	-
O-TKT27	5	1	-	-	-	-	-	-	-	-	-
O-TKY 31	2	-	-	-	3	-	-	-	-	-	-
O-TKS32	4	-	4	1	1	-	-	2	-	3	-
O-TKS33	-	3	1	5	5	-	-	5	-	-	-
O-TKS34	5	-	-	-	15	-	-	7	-	3	-
O-TKS35	10	-	8	-	11	-	-	3	-	5	-
O-TKS36	9	2	17	15	18	10	-	-	-	-	-
O-TKS37	15	-	17	-	20	-	-	-	-	-	-

O-TKS38	12	5	22	-	25	19	-	3	-	1	-
O-TKC42	-	-	3	-	6	-	-	2	-	-	-
O-TKC46	10	-	18	-	16	2	-	-	-	-	-
O-TKC47	5	-	7	5		3	-	2	-	-	-
O-TK50	3	2	9	5	7	10	-	1	-	2	-
O-TK51	-	-	10	-	13	-	-	-	-	-	-
O-TK52	3	2	10	-	-	9	-	1	-	2	-
O-TK58	20	12	13	-	20	17	-	-	-	-	-
O-TKK67	17	-	20	-	25	10	-	29	-	-	-
O-TKK68	6	-	-	-	5	-	-	3	-	-	-
O-TKM69	-	7	3	18	16	-	-	12	-	6	-
O-TKM70	15	-	10	-	18	1	-	20	-	-	-
O-TKM72	-	10	6	-	7	8	-	20	-	-	-
O-TKM73	-	1	13	-	13	12	-	17	-	3	-
O-TKM74	-	1	19	-	10	11	-	20	-	3	-
O-TKM76	10	-	13	-	13	6	-	-	-	-	-
O-TKM77	-	3	13	-	7	7	-	13	-	-	-
O-TKM78	-	-	-	-	-	1	-	-	-	-	-
O-TKD79	6	5	13	1	10	7	-	12	-	3	-
O-TKD 81	3	14	3	1	69	7	-	2	-	5	-
O-TKD83	5	-	7	-	-	-	-	-	-	-	-
O-TKD84	14	14	15	-	10	6	-	-	-	-	-
O-TKD85	4	-	13	-	23	10	-	-	-	-	-
O-TKD86	-	7	10	-	20	7	-	30	-	-	-
O-TKD87	15	12	25	-	27	6	-	30	-	6	-

O-TKD88	-	-	13	-	20	13	-	19	-	8	-
O-TKD89	16	20	14	1	20	-	-	-	-	4	-
O-TKD90	8	-	-	3	5	7	-	-	-	-	-
O-TKD 94	28	15	25	-	23	-	-	23	-	-	-
O-TKD95	16	12	25	-	13	10	-	-	-	-	-
O-TKD97	10	7	9	-	12	10	-	-	-	3	-
O-TKD 99	8	-	5	2	10	7	-	4	-	2	-
O-TKD100	10	15	4	-	7	3	-	3	-	2	-
O-TKD101	4	3	3	-	5	8	1	4	-	-	-
O-TKD111	15	-	10	-	-	7	-	-	-	-	4
O-TKK112	12	11	-	-	7	10	-	-	-	-	-
O-TKK120	8	-	14	-	11	13	-	4	-	3	-
O-TKK121	20	12	-	-	11	7	-	-	-	-	3
O-TKK 125	14	13	3	-	7	9	-	5	-	-	3

Data is based on 100 cm^3 soil samples taken from olive orchards.

Table 6. The number of plant parasitic nematodes found in grapes yards from south part of Turkey in 2014-2015.

Sample Code	*Aphelenchus*	*Aphelenchoides*	*Pratylenchus*	*Paratylenchus*	*Tylenchus*	*Ditylenchus*	*Xi phenema*	*Helicotylenchus*	*Hemicycliophora*	*Meloidogyne*	*Filenchus*
	Plant Parasitic Nematodes										
G-TKAY2	2	-	2	-	-	6	-	-	1	-	-
G-TKAY3	6	1	-	-	-	1	-	-	-	-	-
G-TKAY6	-	-	-	-	-	-	-	-	-	-	-
G-TKAY7	2	-	-	-	-	-	-	-	-	-	-
G-TKAB8	2	2	-	-	-	-	-	-	-	-	-
G-TKAK10	2	-	-	-	-	-	-	-	-	-	-
G-TKAK12	1	-	-	-	1	-	-	-	-	-	-
G-TKAK13	12	5	-	-	-	-	-	-	-	-	-
G-TKAK14	-	-	-	-	-	-	-	-	-	-	-
G-TKAK16	3	-	1	-	1	4	-	-	-	-	-
G-TKT22	4	-	-	-	13	-	-	-	-	-	-
G-TKT24	8	-	-	-	1	1	-	-	-	-	-
G-TKT25	8	1	-	-	2	1	-	1	-	-	-
G-TKT28	2	-	-	-	2	-	-	-	-	-	-
G-TK29	1	-	-	-	9	-	-	-	-	-	-
G-TKS39	8	6	3	2	5	8	-	3	-	-	-
G-TKS41	10	-	7	5	-	-	-	-	-	1	-

G-TKC43	18	-	25	10	17	14	-	3		2	-
G-TKC44	-	2	20	-	12	3	1	2	-	-	-
G-TK53	-	5	-	7	5	9	-	-		3	-
G-TK 54	5	3	8	1	8	9	-	1	-	2	-
G-TK56	13	15	20	-	20	12	-	-	-	1	-
G-TKK60	-	13	10	10	13	3	-	2	-	3	-
G-TKK61	7	6	10	-	11	10	-	1	-	-	-
G-TKK63	1	-	7	-	10	-	-	-	-	-	-
G-TKK64	5	-	-	-	4	3	-	5	-	-	-
G-TKK65	11	1	13	-	10	5	-	-	-	-	-
G-TKM71	7	5	10	-	15	3	-	-	-	-	-
G-TKD92	17	15	18	-	19	10	1	20	-	-	-
G-TKD93	16	7	21	-	15	12	-	22	-	-	-
G-TKK117	-	-	9	-	18	11	-	-	-	3	6
G-TKK118	-	10	7	-	-	7	-	5	-	-	-
G-TKK123	8	13	4	-	5	-	-	7	-	-	-
G-TKK124	3	-	6	-	6	5	-	-	-	-	2

Data is based on 100 cm^3 of soil samples taken from the grapes fields.

Table 7. The number of plant parasitic nematodes found in mix fruits areas from south part of Turkey in 2014-2015.

Sample Code	Plant Parasitic Nematodes										
	Aphelenchus	*Aphelenchoides*	*Pratylenchus*	*Paratylenchus*	*Tylenchus*	*Ditylenchus*	*Xi phenema*	*Helicotylenchus*	*Hemicycliophora*	*Meloidogyne*	*Filenchus*
M-TKAY4	7	2	2	-	-	-	1	-	-	-	-
M-TKAY5	8	6	-	-	-	-	-	-	-	-	-
M-TKAK17	3	-	-	-	-	-	-	-	-	-	-
M-TK20	4	13	-	-	-	-	-	-	-	-	-
M-TK 30	-	3	-	-	5	-	-	-	-	-	-
M-TKS40	18	-	13	10	23	-	-	5	-	14	-
M-TKC45	20	-	13	12	15	-	-	-	-	-	-
M-TKC48	10	4	22	-	20	13	-	-	-	-	-
M-TK49	10	8	16	6	3	20	-	-	-	-	-
M-TK55	6	-	5	1	-	-	-	-	-	1	-
M-TK57	10	3	13	-	13	-	-	-	-	-	-
M-TKK59	-	10	13	-	11	-	-	-	-	-	-
M-TKK62	-	-	4	-	9	7	-	-	-	-	-
M-TKK66	-	3	10	-	11	-	-	3	-	-	-
M-TKM75	-	7	10	-	13	10	-	-	-	5	-
M-TKD80	10	-	-	5	15	13	-	19	-	-	-
M-TKD82	10	5	2	-	6	3	-	2	-	-	-

M-TKD91	19	17	-	-	23	17	-	23	-	2	-
M-TKD96	18	12	19	-	23	19	-	-	-	7	-
M-TKD98	5	13	10	-	-	-	-	3	-	2	-
M-TKD102	7	12	3	4	-	4	-	6	-	-	-
M-TKD103	12	-	20	-	13	11	-	3	-	-	-
M-TKD104	12	11	10	-	13	-	-	3	-	3	-
M-TKD105	12	-	10	-	13	-	-	3	-	2	-
M-TKD106	6	-	15	-	-	11	-	-	-	-	1
M-TKD107	7	-	2	-	-	7	-	8	-	-	1
M-TKD108	7	-	2	-	11	2	-	3	-	-	-
M-TKD109	4	15	13	-	13	12	-	16	-	-	-
M-TKD110	6	-	8	-	18	8	-	7	-	1	-
M-TKK113	-	-	7	-	10	12	-	-	-	-	2
M-TKK114	3	7	15	-	16	3	-	-	-	-	-
M-TKK115	-	5	3	-	10	6	-	6	-	3	-
M-TKK116	16	13	3	-	15	-	-	-	-	-	-
M-TKK119	11	18	19	6	15	-	-	3	-	-	1
M-TKK122	12	4	7	-	17	11	-	4	-	-	-

Data is based on 100 cm^3 soil samples taken from mix fruits areas.

Table 8. The number of free living (bacterivorous and fungivorous) nematodes found olive yards from south part of Turkey in 2014-2015.

	Free Living Nematodes														
Sample Code	Bacterivorous											Fungivorous			
	Monhystera	*Wilsonema*	*Rhabditis*	*Acrolobus*	*Acrobeles*	*Chiloplacus*	*Cephalobus*	*Eucephalobus*	*Amphidelus*	*Cervidellus*	*Panagrolaimus*	*Aphelenchus*	*Aphelenchoides*	*Tylenchus*	*Ditylenchus*
O-TKAY1	-	-	-	-	-	-	-	-	-	-	-	2	2	-	-
O-TKAB9	-	-	1	-	-	5	4	-	-	-	-		1	-	-
O-TKAK11	8	-	-	-	-	-	3	2	-	-	-	2	-	-	-
O-TKAK15	1	-	-	-	-	3	-	1	-	-	-	-	-	-	5
O-TKAK18	4	-	-	-	-	-	-	-	-	-	-		1	-	-
O-TKAK19	1	-	-	-	-	-	-	-	-	-	-	4	-	-	1
O-TKT21	2	-	-	-	-	-	-	-	-	1	-	4	3	-	-
O-TKT23	-	-	-	-	-	1	1	-	-	-	1	7	-	4	1
O-TKT26	1	1	-	-	-	3	2	1	1	1	-	3	12	14	-
O-TKT27	9	2	-		2	-	3	1	-	-	-	5	1	-	-
O-TKY 31	3	-	-	-	-	4	14	3	-	-	-	2	-	3	-
O-TKS32	8	-	1	-	2	3	-	3	-	-	-	4	-	1	-
O-TKS33	6	5	3	1	3	-	-	9	-	-	-	-	3	5	-
O-TKS34	6	10	-	9	-	3	-	12	-	-	-	5	-	15	-
O-TKS35	15	2	-	-	-	3	2	8	-	-	-	10	-	11	-
O-TKS36	15	2	2	18	-	-	3	13	-	-	-	9	2	18	10
O-TKS37	22	-	-	12	19	-	-	9	-	-	-	15	-	20	-

O-TKS38	23	3	2	18	-	1	-	11	-	-	-	12	5	25	19
O-TKC42	4	-	-	-	2	-	3	-	-	-	-	-	-	6	-
O-TKC46	20	-	-	13	-	-	13	-	-	-	-	10	-	16	2
O-TKC47	7	2	-	3	3	-	4	6	-	-	-	5	-	-	3
O-TK50	15	-	-	8	-	-	1	-	-	-	-	3	2	7	10
O-TK51	15	-	9	12	-	-	9	13	-	-	-	-	-	13	-
O-TK52	7	1	6	5	-	-	5	-	-	-	-	3	2	-	9
O-TK58	10	-	-	15	-	-	3	5	-	-	-	20	12	20	17
O-TKK67	10	-	3	13	2	-	15	-	-	-	-	17	-	25	10
O-TKK68	-	2	-	-	-	-	-	3	-	-	-	6	-	5	-
O-TKM69	20	1	-	11	-	-	-	6	-	-	-	-	7	16	-
O-TKM70	-	-	-	13	-	2	-	12	-	-	-	15	-	18	1
O-TKM72	-	2	-	13	1	-	7	13	-	-	-	-	10	7	8
O-TKM73	2	3	-	8	10	-	6	5	-	-	-	-	1	13	12
O-TKM74	3	8	-	-	-	-	-	3	-	-	-	-	1	10	11
O-TKM76	12	-	-	5	1	-	17	13	-	-	-	10	-	13	6
O-TKM77	4	2	-	-	-	-	3	5	-	-	-	-	3	7	7
O-TKM78	-	-	-	-	1	-	-	-	-	-	-	-	-	-	1
O-TKD79	11	-	-	6	-	-	2	2	-	-	-	6	5	10	7
O-TKD 81	9	2	-	14	7	5	4	10	-	-	-	3	14	69	7
O-TKD83	4	-	-	3	-	-	-	-	-	-	-	5	-	-	-
O-TKD84	13	-	-	15	-	-	-	7	-	-	-	14	14	10	6
O-TKD85	10	9	-	13	3	-	17	-	-	-	-	4	-	23	10
O-TKD86	10	-	2	23	5	5	10	11	-	-	-	-	7	20	7
O-TKD87	13	8	-	23	-	7	-	3	-	-	-	15	12	27	6

O-TKD88	7	-	-	15	-	4	12	-	-	-	-	-	-	20	13
O-TKD89	15	3	-	13	-	13	7	6	-	-	-	16	20	20	-
O-TKD90	-	-	-	6	-	2	3	4	-	-	-	8	-	5	7
O-TKD 94	19	-	5	18	2	-	-	18	-	-	-	28	15	23	-
O-TKD95	7	1	-	-	-	15	12	9	-	-	-	16	12	13	10
O-TKD97	5	3	-	13	-	9	-	15	-	2	-	10	7	12	10
O-TKD 99	3	3	-	-	-	-	3	8	-	-	-	8	-	10	7
O-TKD100	-	-	-	8	-	-	-	9	-	-	-	10	15	7	3
O-TKD101	5	2	-	4	5	4	9	-	1	-	-	4	3	5	8
O-TKD111	6	-	-	11	5	-	-	-	-	-	-	15	-	-	7
O-TKK112	3	2	-	6	-	2	3	5	-	-	-	12	11	7	10
O-TKK120	-	-	-	12	20	-	7	5	-	-	-	8	-	11	13
O-TKK121	13	-	2	5	-	3	-	9	-	-	-	20	12	11	7
O-TKK 125	7	6	7	4	2	10	-	-	-	-	-	14	13	7	9

Data is based on 100 cm^3 soil samples taken from olive yards.

Table 9. The number of free living (bacterivorous and fungivorous) nematodes found in grape yards of south part of Turkey in 2014-2015.

	Free Living Nematodes														
Sample Code	Bacterivorous											Fungivorous			.
	Monhystera	*Wilsonema*	*Rhabditis*	*Acrolobus*	*Acrobeles*	*Chiloplacus*	*Cephalobus*	*Eucephalobus*	*Amphidelus*	*Cervidellus*	*Panagrolaimus*	*Aphelenchus*	*Aphelenchoides*	*Tylenchus*	*Ditylenchus*
G-TKAY2	7	-	-	-	-	-	-	-	-	-	2	2	-	-	6
G-TKAY3	4	-	2	-	-	-	-	-	1	-	-	6	1	-	1
G-TKAY6	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
G-TKAY7	5	-	-	-	-	1	-	-	-	-	-	2	-	-	-
G-TKAB8	6	-	-	-	-	-	3	-	-	-	6	2	2	-	-
G-TKAK10	1	-	-	-	-	3	3	3	-	-	-	2	-	-	-
G-TKAK12	-	-	-	-	-	-	2	1	-	-	-	1	-	1	-
G-TKAK13	1	-	-	-	-	-	-	-	-	-	-	12	5	-	-
G-TKAK14	4	-	-	-	-	-	3	-	-	-	-	-	-	-	-
G-TKAK16	1	-	-	-	-	1	3	-	-	-	-	3	-	1	4
G-TKT22	-	-	-	-	-	4	-	1	-	-	2	4	-	13	-
G-TKT24	-	-	-	-	-	1	-	1	-	-	-	8	-	1	1
G-TKT25	4	2	1	-	1	11	-	2	-	-	-	8	1	2	1
G-TKT28	1	2	3	-	2	2	1	1	-	-	1	2	-	2	-
G-TK29	-	-	-	-	-	-	-	-	-	-	-	1	-	9	-
G-TKS39	7	-	-	10	3	-	-	-	-	-	-	8	6	5	8

G-TKS41	2	3	-	3	2	8	2	3	-	-	-	10	-	-	-
G-TKC43	30	1	5	20	-	-	22	11	-	-	-	18	-	17	14
G-TKC44	12	-	5	10	-	-	-	-	-	-	-	-	2	12	3
G-TK53	8	-	-	5	-	2	-	-	-	-	-	-	5	5	9
G-TK 54	10	1	5	7	-	-	6	-	-	-	-	5	3	8	9
G-TK56	25	2	5	11	15	-	6	-	-	-	-	13	15	20	12
G-TKK60	-	-	-	9	-	4	-	12	-	-	-	-	13	13	3
G-TKK61	13	2	-	1	-	-	-	12	-	-	-	7	6	11	10
G-TKK63	10	-	-	4	-	1	3	-	-	-	-	1	-	10	-
G-TKK64	2	-	-	6	-	-	-	-	-	-	-	5	-	4	3
G-TKK65	7	1	2	15	-	1	7	-	-	-	-	11	1	10	5
G-TKM71	7	3	-	10	-	2	13	11	-	-	-	7	5	15	3
G-TKD92	20	-	-	15	-	7	7	12	-	-	-	17	15	19	10
G-TKD93	11	-	6	-	-	3	10	-	-	-	-	16	7	15	12
G-TKK117	7	-	-	15	-	5	8	10	-	-	-	-	-	18	11
G-TKK118	6	-	25	18	-	8	-	16	-	-	-	-	10	-	7
G-TKK123	7	-	6	3	2	2	-	-	-	-	-	8	13	5	-
G-TKK124	10	-	3	4	-	8	5	-	-	-	-	3	-	6	5

Data is based on 100 cm^3 soil samples taken from grape yards.

Table 10. The number of free living (bacterivorus and fungivorous) nematodes found in mix fruits yards from south part of Turkey in 2014-2015.

Sample Code	Free Living Nematodes														
	Bacterivorous											Fungivorous			
	Monhystera	*Wilsonema*	*Rhabditis*	*Acrolobus*	*Acrobeles*	*Chiloplacus*	*Cephalobus*	*Eucephalobus*	*Amphidelus*	*Cervidellus*	*Panagrolaimus*	*Aphelenchus*	*Aphelenchoides*	*Tylenchus*	*Ditylenchus*
M-TKAY4	1	-	-	-	-	1	1	-	-	1	1	7	2	-	-
M-TKAY5	4	-	-	1	-	-	2	-	-	-	-	8	6	-	-
M-TKAK17	1	-	-	-	-	-	-	-	-	-	-	3	-	-	-
M-TK20	6	-	-	-	-	1	-	-	-	-	1	4	13	-	-
M-TK 30	7	-	-	1	-	-	3	2	-	-	-	-	3	5	-
M-TKS40	20	-	-	11	-	-	2	15	-	-	-	18	-	23	-
M-TKC45	16	2	-	18	-	-	-	10	-	-	-	20	-	15	-
M-TKC48	22	2	-	18	-	2	7	-	2	-	-	10	4	20	13
M-TK49	12	-	1	7	-	-	-	2	6	-	-	10	8	3	20
M-TK55	6	-	3	-	-	-	-	5	-	-	-	6	-	-	-
M-TK57	20	2	-	12	-	15	5	18	2	-	-	10	3	13	-
M-TKK59	7	-	-	10	-	-	5	-	-	-	-	-	10	11	-
M-TKK62	6	1	-	6	-	-	2	2	-	-	-	-	-	9	7
M-TKK66	-	1	-	-	-	-	4	13	-	-	-	-	3	11	-
M-TKM75	3	3	-	11	-	-	5	6	-	-	-	-	7	13	10
M-TKD80	13	-	3	-	17	-	-	7	-	-	-	10	-	15	13
M-TKD82	8	2	2	5	-	5	-	-	-	-	-	10	5	6	3
M-TKD91	13	1	-	-	-	3	11	15	-	-	-	19	17	23	17

M-TKD96	10	-	-	19	5	-	-	-	-	-	-	18	12	23	19
M-TKD98	-	1	-	2	-	2	3	13	-	-	-	5	13	-	-
M-TKD102	8	-	-	1	8	4	5	-	-	-	-	7	12	-	4
M-TKD103	8	1	5	-	-	7	15	-	-	-	-	12	-	13	11
M-TKD104	13	-	-	5	2	-	4	-	-	-	-	12	11	13	-
M-TKD105	6	-	7	7	11	-	14	-	-	-	-	12	-	13	-
M-TKD106	16	-	7	13	-	-	10	-	-	-	-	6	-	-	11
M-TKD107	10	2	1	3	-	2	-	9	1	-	-	7	-	-	7
M-TKD108	9	-	-	10	-	-	-	7	-	-	-	7	-	11	2
M-TKD109	7	-	6	5	-	-	3	20	7	-	-	4	15	13	12
M-TKD110	2	-	5	13	-	2	-	-	4	-	-	6	-	18	8
M-TKK113	-	-	-	3	-	-	-	-	-	-	-	-	-	10	12
M-TKK114	5	-	7	10	-	2	13	-	-	-	-	3	7	16	3
M-TKK115	-	-	-	11	-	-	-	-	-	-	-	-	5	10	6
M-TKK116	7	-	5	6	-	-	4	10	-	-	-	16	13	15	-
M-TKK119	8	-	-	7	2	-	-	17	-	-	-	11	18	15	-
M-TKK122	4	-	-	14	-	2	5	16	11	-	-	12	4	17	11

Data is based on 100 cm^3 soil samples taken from mix fruits yards.

Table 11. The number of predaceous nematodes found in olive yards from south part of Turkey in 2014-2015.

	Predacious Nematodes					
Sample Code	*Labronema*	*Eudorylaimus*	*Discolaimus*	*Aprocelaimus*	*Sienura*	*Monunchus*
O-TKAY1	-	-	-	-	-	-
O-TKAB9	1	1	-	-	-	-
O-TKAK11	1	1	-	-	-	-
O-TKAK1	3	3	-	-	-	-
O-TKAK18	2	3	-	-	-	-
O-TKAK19	-	-	-	-	2	-
O-TKT21	3	-	-	-	-	-
O-TKT23	1	3	-	-	-	-
O-TKT26	2	1	1	-	-	-
O-TKT27	1	-	-	-	-	-
O-TKY 31	5	1	1	-	-	-
O-TKS32	-	6	-	-	-	-
O-TKS33	12	14	-	-	-	-
O-TKS34	8	10	-	-	-	-
O-TKS35	7	11	-	-	-	2
O-TKS36		6	-	-	-	2
O-TKS37	2	10	-	-	-	-
O-TKS38	5	13	-	-	-	1
O-TKC42	1	3	-	-	-	-
O-TKC46	-	8	-	-	-	2

O-TKC47	3	10	-	-	-	-
O-TK50	-	12	2	-	-	-
O-TK51	9	12	-	-	-	-
O-TK52	-	8	-	-	-	1
O-TK58	5	-	-	-	-	3
O-TKK67	5	13	-	-	-	-
O-TKK68	2	4	-	-	-	-
O-TKM69	5	-	-	-	-	-
O-TKM70	-	-	-	-	-	-
O-TKM72	5	13	-	-	-	-
O-TKM73	-	9	-	2	-	1
O-TKM74	7	13	-	5	-	12
O-TKM76	5	10	-	-	-	-
O-TKM77	5	6	-	-	-	3
O-TKM78	3	-	-	-	3	-
O-TKD79	-	8	-	1	-	1
O-TKD 81	12	2	-	-	-	-
O-TKD83	2	-	-	-	-	-
O-TKD84	8	-	-	13	-	3
O-TKD8	6	5	-	-	-	-
O-TKD86	-	15	-	-	-	-
O-TKD87	4	10	-	-	-	-
O-TKD88	7	-	-	-	-	3
O-TKD89	-	-	-	-	-	8
O-TKD90	5	-	-	-	-	2

O-TKD 94	-	12	-	-	-	16
O-TKD95	-	8	-	-	-	-
O-TKD97	-	15	-	-	-	-
O-TKD 99	-	-	-	-	-	-
O-TKD100	-	-	-	-	-	2
O-TKD101	6	1	-	-	-	2
O-TKD111	13	8	-	-	-	-
O-TKK112	3	8	-	-	-	-
O-TKK120	-	6	-	-	-	4
O-TKK121	-	-	-	5	-	-
O-TKK 125	-	8	-	-	-	-

Data is based on 100 cm^3 soil samples taken from olive yards.

Table 12. The number of predaceous nematodes found in grapes yards from south part of Turkey in 2014-2015.

	Predacious Nematodes					
Sample Code	*Labronema*	*Eudorylaimus*	*Discolaimus*	*Aprocelaimus*	*Sienura*	*Monunchus*
G-TKAY2	1	-	-	-	-	-
G-TKAY3	-	1	-	-	-	-
G-TKAY6	-	-	-	-	1	-
G-TKAY7	-	-	-	-	-	-
G-TKAB8	7	4	-	-	-	-
G-TKAK10	1	-	-	-	-	-
G-TKAK12	-	-	-	-	-	-
G-TKAK13	2	2	1	-	-	-
G-TKAK14	1	-	-	-	-	-
G-TKAK16	7	1	-	-	-	-
G-TKT22	4	3	-	-	-	-
G-TKT24	1	1	-	-	2	-
G-TKT25	-	2	-	-	-	-
G-TKT28	-	2	-	-	-	-
G-TK29	-	-	-	-	-	-
G-TKS39	3	4	-	-	-	-
G-TKS41	2	2	-	-	-	-
G-TKC43	19	13	1	-	-	1
G-TKC44	11	13	-	-	-	-
G-TK53	-	7	-	-	-	3
G-TK 54	5	6	-	-	-	-

G-TK56	-	13	-	-	-	-
G-TKK60	-	7	-	-	-	-
G-TKK61	7	-	-	-	-	-
G-TKK63	-	-	-	-	-	8
G-TKK64	7	3	-	-	-	-
G-TKK65	-	12	-	-	-	9
G-TKM71	18	15	-	-	-	-
G-TKD92	8	-	-	-	-	-
G-TKD93	8	12	-	-	-	-
G-TKK117	-	17	-	-	-	-
G-TKK118	10	1	-	7	-	-
G-TKK123	-	5	3	-	-	-
G-TKK124	7	5	-	-	-	3

Data is based on 100 cm^3 soil samples taken from grapes yards fields.

Table 13. The number of predaceous nematodes found in mixed fruits yards from south part of Turkey in 2014-2015.

	Predacious Nematodes					
Sample Code	*Labronema*	*Eudorylaimus*	*Discolaimus*	*Aprocelaimus*	*Sienura*	*Monunchus*
M-TKAY4	-	-	1	-	-	-
M-TKAY5	-	1	-	-	-	-
M-TKAK17	-	-	-	-	-	-
M-TK20	1	4	-	-	-	-
M-TK 30	-	1	-	-	-	-
M-TKS40	7	17	-	-	-	-
M-TKC45	9	11	-	-	-	-
M-TKC48	15	19	3	-	-	6
M-TK49	10	22	-	-	-	-
M-TK55	-	10	-	-	-	-
M-TK57	-	-	2	-	-	9
M-TKK59	5	11	-	-	-	2
M-TKK62	5	3	-	-	-	2
M-TKK66	6	5	-	-	-	4
M-TKM75	-	11	-	-	-	-
M-TKD80	17	16	-	-	-	11
M-TKD82	3	4	-	1	-	-
M-TKD91	20	10	-	-	-	5
M-TKD96	18	25	-	3	-	15
M-TKD98	5	6	-	-	-	-
M-TKD102	2	3	-	-	-	-

M-TKD103	7	18	-	-	-	1
M-TKD104	-	16	-	-	-	-
M-TKD105	4	19	-	1	-	-
M-TKD106	5	-	-	-	-	3
M-TKD107	4	8	-	-	-	-
M-TKD108	4	10	-	-	-	-
M-TKD109	5	13	-	-	-	3
M-TKD110	3	4	-	-	-	-
M-TKK113	4	2	-	-	-	-
M-TKK114	-	6	3	-	-	-
M-TKK115	-	7	-	-	-	-
M-TKK116	-	3	-	-	-	-
M-TKK119	10	5	2	-	-	-
M-TKK122	2	-	-	-	-	4

Data is based on 100 cm^3 soil samples taken from mixed fruits yards.

Table 14. The number of omnivorous nematodes found in olive yards from south part of Turkey in 2014-2015.

	Omnivorous Nematodes					
Sample Code	*Labronema*	*Eudorylaimus*	*Ecumenicus*	*Aprocelaimus*	*Mesodorylaimus*	*Dorylaimus*
O-TKAY1	-	-	-	-	-	-
O-TKAB9	1	1	-	-	-	-
O-TKAK11	1	1	-	-	-	-
O-TKAK15	3	3	-	-	-	-
O-TKAK18	2	3	-	-	-	-
O-TKAK19	-	-	-	-	-	-
O-TKT21	3	-	-	-	-	-
O-TKT23	1	3	-	-	-	-
O-TKT26	2	1	-	-	-	-
O-TKT27	1	-	-	-	-	-
O-TKY 31	5	1	-	-	-	-
O-TKS32	-	6	-	-	-	-
O-TKS33	12	14	-	-	-	3
O-TKS34	8	10	-	-	-	-
O-TKS35	7	11	-	-	-	5
O-TKS36	-	6	-	-	-	-
O-TKS37	2	10	-	-	-	-
O-TKS38	5	13	-	-	-	-
O-TKC42	1	3	-	-	-	-
O-TKC46	-	8	-	-	-	-
O-TKC47	3	10	-	-	-	-
O-TK50	-	12	-	-	-	-

O-TK51	9	12	5	-	-	-
O-TK52	-	8	-	-	-	-
O-TK58	5	-	6	-	-	2
O-TKK67	5	13	3	-	-	-
O-TKK68	2	4	-	-	-	-
O-TKM69	5	-	-	-	-	-
O-TKM70	-	-	-	-	-	3
O-TKM72	5	13	-	-	-	-
O-TKM73	-	9	6	2	-	5
O-TKM74	7	13	8	5	-	5
O-TKM76	5	10	-	-	-	-
O-TKM77	5	6	3	-	-	-
O-TKM78	3	-	-	-	-	-
O-TKD79	-	8	-	1	-	-
O-TKD 81	12	2	2	-	-	-
O-TKD83	2	-	-	-	-	-
O-TKD84	8	-	-	13	-	-
O-TKD85	6	5	-	-	-	-
O-TKD86	-	15	3	-	-	-
O-TKD87	4	10	-	-	-	-
O-TKD88	7	-	3	-	-	-
O-TKD89	-	-	-	-	-	-
O-TKD90	5	-	-	-	-	-
O-TKD 94	-	12	-	-	-	-
O-TKD95	-	8	-	-	-	-

O-TKD97	-	15	-	-	-	-
O-TKD 99	-	-	-	-	-	6
O-TKD100	-	-	-	-	-	-
O-TKD101	6	1	-	-	-	-
O-TKD111	13	8	-	-	-	-
O-TKK112	3	8	8	-	-	-
O-TKK120	-	6	1	-	2	3
O-TKK121	-	-	-	5	-	-
O-TKK 125	-	8	-	-	2	-

Data is based on 100 cm^3 soil samples taken from olive yards.

Table 15. The number of omnivorous nematodes found in grapes yards from South of part Turkey in 2014-2015.

	Omnivorous Nematodes					
Sample Code	*Labronema*	*Eudorylaimus*	*Ecumenicus*	*Aprocelaimus*	*Mesodorylaimus*	*Dorylaimus*
G-TKAY2	1	-	-	-	-	-
G-TKAY3	-	1	-	-	-	-
G-TKAY6	-	-	-	-	-	-
G-TKAY7	-	-	-	-	-	-
G-TKAB8	7	4	-	-	-	-
G-TKAK10	1	-	-	-	-	-
G-TKAK12	-	-	-	-	-	-
G-TKAK13	2	2	-	-	-	-
G-TKAK14	1	-	-	-	-	-
G-TKAK16	7	1	-	-	-	-
G-TKT22	4	3	-	-	-	-
G-TKT24	1	1	-	-	-	-
G-TKT25	-	2	-	-	-	-
G-TKT28	-	2	-	-	-	-
G-TK29	-	-	-	-	-	-
G-TKS39	3	4	-	-	-	-
G-TKS41	2	2	-	-	-	-
G-TKC43	19	13	-	-	-	-
G-TKC44	11	13	-	-	-	-
G-TK53	-	7	-	-	-	6
G-TK 54	5	6	1	-	-	-

G-TK56	-	13	2	-	-	-
G-TKK60	-	7	-	-	-	5
G-TKK61	7	-	-	-	-	2
G-TKK63	-	-	-	-	-	-
G-TKK64	7	3	3	-	-	-
G-TKK65	-	12	-	-	-	-
G-TKM71	18	15	5	-	-	-
G-TKD92	8	-	-	-	-	-
G-TKD93	8	12	-	-	-	2
G-TKK117	-	17	-	-	-	-
G-TKK118	10	1	-	7	-	9
G-TKK123	-	5	-	-	-	-
G-TKK124	7	5	-	-	-	-

Data is based on 100 cm^3 soil samples taken from grapes yards.

Table 16. The number of omnivorous nematodes found in mixed fruits yards from south part of Turkey in 2014-2015.

	Omnivorous Nematodes					
Sample Code	*Labronema*	*Eudorylaimus*	*Ecumenicus*	*Aprocelaimus*	*Mesodorylaimus*	*Dorylaimus*
M-TKAY4	-	-	-	-	-	-
M-TKAY5	-	1	-	-	-	-
M-TKAK17	-	-	-	-	-	-
M-TK20	1	4	-	-	-	-
M-TK 30	-	1	-	-	-	-
M-TKS40	7	17	-	-	-	-
M-TKC45	9	11	-	-	-	-
M-TKC48	15	19	-	-	-	-
M-TK49	10	22	5	-	-	-
M-TK55	-	10	3	-	-	6
M-TK57	-	-	13	-	-	-
M-TKK59	5	11	2	-	-	5
M-TKK62	5	3	-	-	-	-
M-TKK66	6	5	3	-	-	-
M-TKM75	-	11	-	-	-	3
M-TKD80	17	16	-	-	-	-
M-TKD82	3	4	-	1	-	-
M-TKD91	20	10	-	-	-	-
M-TKD96	18	25	-	3	-	-
M-TKD98	5	6	-	-	-	-
M-TKD102	2	3	-	-	-	-

M-TKD103	7	18	-	-	18	-
M-TKD104	-	16	-	-	-	-
M-TKD105	4	19	-	1	-	-
M-TKD106	5	-	-	-	-	-
M-TKD107	4	8	-	-	-	5
M-TKD108	4	10	-	-	-	-
M-TKD109	5	13	-	-	-	-
M-TKD110	3	4	-	-	-	-
M-TKK113	4	2	-	-	-	-
M-TKK114	-	6	4	-	18	-
M-TKK115	-	7	4	-	-	-
M-TKK116	-	3	-	-	-	7
M-TKK119	10	5	-	-	-	-
M-TKK122	2	-	-	-	3	-

Data is based on 100 cm^3 soil samples taken from mixed fruits yards.

From northern Iraq, total of 27, 81, and 17 soil samples were collected for olive grape and mixed fruits, respectively. Total of eight genera of plant parasitic nematodes namely *Aphelenchus* spp. *Aphelenchoides* spp. *Pratylenchus* spp. *Paratylenhus* spp. *Tylenchus* spp. *Ditylenchus* spp. *Helicotylenchus* spp. *Meloidogyne* spp. were observed from olive and mixed fruits soil samples. The latter two crops in Iraq did not contain *Xiphinema* spp. *Hemicycliophora* spp. and *Filenchus* spp. as compared to the genera of Turkey (Table 17, 19). Nevertheless, grapes retained similar genera with an additional of *Xiphinema* spp. as shown in Table 18.

Overall, 15 genera of free living nematodes namely *Monhystera* spp. *Wilsonema* spp. *Rhabditis* spp. *Acrolobus* spp. *Acrobeles* spp. *Chiloplacus* spp. *Cephalobus* spp. *Eucephalobus* spp. *Amphidelus* spp. *Cervidellus* spp. and *Panagrolaimus* spp. as bacterivorous, and *Aphelenchus* app. *Aphelenchoides* spp. *Tylenchus* spp. and *Ditylenchus* spp., as fungivorous were detected. Latter four genera were regarded also as plant parasitic nematodes (Table 21). The nematode genera found in olive were similar to those of olive soil samples (Table 20) with lacking of *Wilsonema* spp. and *Cervidellus* spp. Nematode genera detected in mixed fruits resembled to those found in grape crop with the absence of *Cervidellus* spp. and *Panagrolaimus* spp. (Table 22).

The predacious nematode genera observed from olive, grape and mixed fruits of Iraq were counted as *Labronema* app. *Eudorylaimus* spp. *Discolaimus* spp. *Mononchus* spp. and *Sienura* spp. The genera *Aprocelaimus* spp. did not appear in all three crops of Iraq as compared to those of Turkey (Table 23, 24, 25).

Five omnivorous genera identified from olive sites were included *Labronema* spp., *Eudorylaimus* spp., *Ecumenicus* spp. (also considers as predacious nematode), *Mesodorylaimus* spp. and *Dorylaimus* spp. (Table 26). The genera *Aprocelaimus* spp. was not founded with comparison of Turkey’s results. Data from grapes sites of northern Iraq revealed the existence of three nematode genus called *Labronema* spp. *Eudorylaimus* spp. and *Dorylaimus* spp. (Table 27). Surveys from mixed fruit sites, however, showed that there were four genera including *Labronema* spp. *Eudorylaimus* spp. *Ecumenicus* spp. *Dorylaimus* spp. (Table 28).

The average numbers of plant parasitic nematodes per sample were shown in Table 29. In general, the average number of *Aphelenchus* spp. *Aphelenchoides* spp. *Pratylenchus* spp. *Paratylenhus* spp. *Tylenchus* spp. *Ditylenchus* spp. were relatively higher than those of *Helicotylenchus* spp. *Meloidogyne* spp. *Xiphinema* spp. *Hemicyclophora* and *Filenchus.* Over the course of this study *Tylenchus* spp. showed significantly the greater numbers for all crops in both countries ($P \leq 0.05$). On the other hand, in all three crops, *Hemicyclophora* and *Filenchus* showed none for northern Iraq and very low (almost none) densities for southern Turkey. Mixed fruits of southern Turkey sustained significantly greater numbers of *Aphelenchus* spp. (7.80), *Aphelenchoides* spp. (5.45), *Pratylenchus* spp. (8.25), *Tylenchus* spp. (10.11), and *Ditylenchus* spp. (5.40) than other crops in both counties ($P \leq 0.05$) (Table 29).

The mean number of free living nematodes found in olive, grape and mixed fruits in south of Turkey and north of Iraq is shown in Table 30. Among total of 15 genera of free living nematodes, *Monhystera* spp., sustained the highest numbers in olive (7.27) and in mixed fruits (7.94) of southern Turkey. The number of *Wilsonema* spp. *Amphidelus* spp. *Cervidellus* spp. and *Panagrolaimus* spp. were very low in all three crops in both countries. Olives of southern Turkey supported significantly more densities of the genus *Acrobeles* spp. (6.94) and *Chiloplacus* (1.91) than the other crops of Turkey and Iraq. Grapes of Iraq, however, revealed significantly more densities of *Acrolobus* spp. (2.83) and *Cephalobus* spp. (5.03) among the other crops of both countries. Mixed fruits of northern Iraq showed significantly greater number of not only *Rhabditis* spp. (4.41) but also *Eucephalobus* (5.76) and *Aphelenchoides* spp. (5.94) among all crops of both countries ($P \leq 0.05$) (Table 30).

The mean number of predacious nematodes found in olive, grape and mixed fruits in south of Turkey and north of Iraq is shown in Table 31. The average number of nematode for each of detected six predacious nematodes genera were varied among three crops of both countries. Overall, *Labronema* app. and *Eudorylaimus* spp. sustained more densities than *Discolaimus* spp. *Aprocelaimus* spp. *Mononchus* spp. and *Sienura* spp. Mixed fruits from southern Turkey persisted significantly greater mean number *Labronema* spp. (4.88) and *Eudorylaimus* spp. (8.28) than other crops in both countries ($P \leq 0.05$) (Table 31).

The mean number of omnivorous nematodes found in olive, grape and mixed fruits in south of Turkey and north of Iraq is shown in Table 32. The average number of nematode for each of detected six predacious nematodes genera were varied among three crops of both countries. Overall, *Labronema* app. and *Eudorylaimus* spp. sustained greater nematode densities than *Ecumenicus* spp. *Aprocelaimus* spp. *Mesodorylaimus* spp. and

Dorylaimus spp. Mixed fruits from southern Turkey persisted significantly greater mean number *Labronema* spp. (4.88) and *Eudorylaimus* spp. (8.28) than other crops in both countries. Grapes groves of northern Iraq contained significantly greater number of nematodes belong to the genus *Mononchus* (3.13) than the other crops of both regions ($P \leq 0.05$) (Table 31).

Table 17. The number of plant parasitic nematodes found in olive yards from northern Iraq in 2014-2015.

Sample Code	Plant Parasitic Nematodes										
	Aphelenchus	*A phelenchoides*	*Pratylenchus*	*Paratylenchus*	*Tylenchus*	*Ditylenchus*	*Xiphenema*	*Helicotylenchus*	*Hemicycliophora*	*Meloidogyne*	*Filenchus*
O-KDS1	1	-	-	-	-	-	-	-	-	-	-
O-KDS3	1	-	-	-	-	4	-	-	-	-	-
O-KDS4	-	-	-	-	-	4	-	-	-	-	-
O-KDG8	1	1	-	-	-	4	-	-	-	-	-
O-KDQ20	-	1	-	-	-	1	-	-	-	-	-
O-KDD23	1	-	-	-	-	-	-	-	-	-	-
O-KDD31	1	-	-	1	2	-	-	-	-	-	-
O-KDQ34	-	2	-	1	1	-	-	-	-	-	-
O-KDS35	-	1	-	1	3	1	-	-	-	-	-
O-KDZ57	1	1	-	1	27	-	-	-	-	1	-
O-KDZ58	9	7	-	1	30	-	-	-	-	9	-
O-KDP69	-	-	-	-	11	-	-	-	-	-	-
O-KDB78	3	-	-	-	12	-	-	-	-	-	-
O-KDE86	-	-	8	7	12	-	-	-	-	-	-
O-KDE89	7	7	8	3	10	2	-	1	-	2	-

O-NDM97	10	12	8	6	-	-	-	-	-	-	-
O-NDM98	25	30	15	31	35	25	-	16	-	-	-
O-NDM99	10	-	10	20	15	13	-	3	-	1	-
O-NDM100	8	-	2	5	4	7	-	-	-	-	-
O-TKK111	-	7	15	-	22	11	-	4	-	-	-
O-TKK112	10	2	5	-	-	21	-	6	-	-	-
O-TKK114	5	12	-	7	-	6	-	-	-	-	-
O-TKK115	3	6	-	-	-	5	-	-	-	-	-
O-TKK116	7	-	5	-	11	3	-	-	-	-	-
O-KDZ117	5	2	-	-	20	4	-	-	-	-	-
O-KDZ124	-	-	8	7	20	-	-	-	-	-	-
O-KDZ125	3	8	-	-	12	-	-	-	-	-	-

Data is based on 100 cm^3 soil samples taken from field olive yards.

Table 18.Number of plant parasitic nematodes found in grape yards from Northern Iraq in 2014-2015.

Sample Code	Plant Parasitic Nematodes										
	Aphelenchus	*Aphelenchoides*	*Pratylenchus*	*Paratylenchus*	*Tylenchus*	*Ditylenchus*	*Xiphenema*	*Helicotylenchus*	*Hemicycliophora*	*Meloidogyne*	*Filenchus*
G-KDZ5	-	3	-	-	-	2	-	-	-	-	-
G-KDZ7	-	-	-	-	-	1	-	-	-	-	-
G-KDG9	-	-	-	-	-	2	-	-	-	-	-
G-KDQ10	1	-	-	-	-	2	-	-	-	-	-
G-KDS12	-	2	-	-	-	3	-	-	-	-	-
G-KDB13	-	4	-	-	-	-	-	-	-	-	-
G-KDB14	-	2	-	-	-	5	-	-	-	-	-
G-KDB15	1	5	-	-	-	6	-	-	-	-	-
G-KDZ16	-	3	-	-	-	3	-	-	-	-	-
G-KDZ17	-	2	-	-	-	3	-	-	-	-	-
G-KDQ18	-	6	-	-	-	5	-	-	-	-	-
G-KDQ19	-	5	-	-	-	3	-	-	-	-	-
G-KDD21	-	-	-	-	8	6	-	-	-	-	-
G-KDD22	5	-	-	-	1	-	-	-	-	-	-
G-KDB24	7	-	-	-	4	2	-	-	-	-	-

G-KDB25	9	1	-	-	4	-	-	-	-	-	-
G-KDP27	-	-	-	-	2	-	-	-	-	-	-
G-KDB29	6	-	-	-	-	-	-	-	-	-	-
G-KDR30	-	-	-	-	-	-	-	-	-	-	-
G-KDG36	-	-	-	-	1	-	-	-	-	-	-
G-KD37	-	6	-	1	1	1	-	-	-	-	-
G-KDP38	1	-	-	2	2	-	-	-	-	-	-
G-KDB39	3	-	-	-	-	-	-	-	-	-	-
G-KDL40	1	1	-	1	-	-	-	-	-	-	-
G-KDB41	7	6	-	-	-	-	-	-	-	-	-
G-KDB42	16	4	-	-	5	-	1	-	-	-	-
G-KDB43	8	3	-	-	5	-	-	-	-	-	-
G-KDB44	8	5	-	-	2	-	-	1	-	-	-
G-KDB45	11	4	-	-	4	-	-	-	-	-	-
G-KDB46	11	3	-	-	9	-	-	-	-	-	-
G-KDB47	2	6	-	-	5	-	-	-	-	-	-
G-KDB48	18	15	-	-	12	-	-	-	-	-	-
G-KDB49	11	6	-	-	5	-	-	-	-	8	-
G-KDB51	20	37	-	-	13	-	-	-	-	6	-
G-KDB52	3	12	-	-	29	-	-	-	-	5	-
G-KDB53	5	8	1	-	35	-	-	-	-	7	-
G-KDB54	17	15	-	-	31	-	-	1	-	13	-
G-KDB56	1	1	-	-	5	-	-	-	-	-	-

G-KDZ59	1	2	-	-	35	-	-	-	-	4	-
G-KDG61	3	7	-	1	18	-	-	2	-	10	-
G-KDG64	13	19	-	-	23	-	-	-	-	2	-
G-KDB65		13	-	-	10	-	-	1	-	2	-
G-KDB66	8	-	-	-	10	-	-	1	-	2	-
G-KDB67	13	31	-	-	17	-	-	2	-	1	-
G-KDB68	12	4	-	-	13	-	-	-	-	10	-
G-KDP70		7	-	-	3	-	-	-	-	-	-
G-KDB71	27	11	-	10	10	-	-	-	-	15	-
G-KDB72	10	8	-	16	13	-	-	-	-	18	-
G-KDB73	8	14	7	-	13	9	-	-	-	5	-
G-KDB74	4	-	-	10	7	-	-	-	-	-	-
G-KDB75	-	-	-	4	4	-	-	-	-	-	-
G-KDB76	10	6	-	5	15	10	-	-	-	2	-
G-KDB77	-	1	-	-	5	3	-	-	-	-	-
G-KDB79	3	-	-	-	7	-	-	-	-	-	-
G-KDB80	-	-	-	-	-	-	-	-	-	-	-
G-KDE81	4	8	4	4	10	1	-	-	-	-	-
G-KDE82	7	8	2	-	18	-	-	-	-	10	-
G-KDE83	10	12	22	20	20	-	-	5	-	8	-
G-KDE84	16	-	15	18	10	-	-	6	-	17	-
G-KDE87	8	-	1	2	3	-	-	-	-	-	-
G-KDE88	3	2	-	7	7	10	-	3	-	2	-

G-KDM91	5	-	9	-	7	3	-	-	-	4	-
G-KDM92	11	10	3	3	9	-	-	-	-	4	-
G-KDM93	10	5	7	8	3	7	-	-	-	10	-
G-KDM94	10	-	7	5	13	-	-	1	-	-	-
G-KDM95	5	2	10	5	22	6	-	3	-	-	-
G-NDM101	18	-	10	20	22	-	-	-	-	-	-
G-NDM102	6	-	-	-	4	-	-	-	-	-	-
G-NDM103	4	8	8	9	3	2	-	-	-	5	-
G-NDM105	5	8	3	2	9	4	-	-	-	-	-
G-NDD106	8	9	-	3	10	6	-	7	-	-	-
G-NDD107	6	-	7	3	4	3	-	-	-	-	-
G-NDD108	-	5	6	12	10	7	-	7	-	3	-
G-NDD109	23	-	-	21	13	-	-	4	-	20	-
G-NDD110	3	9	20	2	-	-	-	-	-	11	-
G-KDZ118	8	-	10	20	10	-	-	-	-	-	-
G-KDZ119	7	-	-	-	9	-	-	-	-	-	-
G-KDZ120	3	-	-	-	17	-	-	-	-	-	-
G-KDZ121	5	8	3	-	9	4	-	-	-	-	-
G-KDZ122	7	8	-	-	6	-	-	-	-	4	-
G-KDZ123	3	-	-	-	9	-	-	-	-	-	-

Data is based on 100 cm^3 soil samples taken from grape yards.

Table 19. The number of plant parasitic nematodes found in mixed fruits yards from northern Iraq in 2014-2015.

Sample Code	Plant Parasitic Nematodes									
	Aphelenchus	*phelenchoides*	*Pratylenchus*	*Paratylenchus*	*Tylenchus*	*Ditylenchus*	*Xiphenema*	*Helicotylenchus*	*Hemicycliophora*	*Meloidogyne*	*Filenchus*
M-KDS2	4	1	-	-	-	1	-	-	-	-	-
M-KDZ6	-	-	-	-	-	-	-	-	-	-	-
M-KDS11	-	1	-	-	-	3	-	-	-	-	-
M-KDB26	2	5	-	-	9	-	-	-	-	-	-
M-KDB28	-	-	-	-	-	-	-	-	-	-	-
M-KDD32	-	-	-	-	20	-	-	-	-	-	-
M-KDA33	1	1	-	-	2	-	-	-	-	-	-
M-KDB50	2	11	-	-	14	-	-	-	-	1	-
M-KDB55	7	18	-	-	37	-	-	1	-	7	-
M-KDG60	9	1	-	-	24	-	-	-	-	6	-
M-KDG62	2	8	-	-	-	-	-	-	-	2	-
M-KDG63	13	36	-	-	12	-	-	2	-	16	-
M-KDE85	10	-	-	-	13	7	-	-	-	5	-
M-KDM90	11	-	15	7	3	-	-	3	-	7	-
M-KDM96	5	13	7	8	23	25	-	3	-	-	-

M-NDM104	12	-	14	-	-	16	-	-	-	-	-
M-TKK113	6	6	12	-	3	6	-	-	-	8	-

Data is based on 100 cm^3 soil samples taken from mixed fruits yards.

Table 20. The number of free living (bacterivorus and fungivorous) nematodes found in olive yards from northern Iraq in 2014-2015.

Free Living Nematodes

Sample Code	Bacterivorous											Fungivorous			
	Monhystera	*Wilsonema*	*Rhabditis*	*Acrolobus*	*Acrobeles*	*Chiloplacus*	*Cephalobus*	*Eucephalobus*	*Amphidelus*	*Cervidellus*	*Panagrolaimus*	*Aphelenchus*	*Aphelenchoides*	*Tylenchus*	*Ditylenchus*
O-KDS1	5	-	1	-	-	-	-	-	-	-	-	1	-	-	-
O-KDS3	2	-	-	-	-	-	-	-	-	-	-	1	-	-	4
O-KDS4	5	-	-	-	-	-	-	-	-	-	-	-	-	-	4
O-KDG8	5	-	2	-	-	-	-	-	-	-	2	1	1	-	4
O-KDQ20	-	-	1	-	-	-	-	-	-	-	-	-	1	-	1
O-KDD23	-	-	-	-	1	5	-	-	-	-	-	1	-	-	-
O-KDD31	5	-	-	-	1	-	1	-	-	-	-	1	-	2	-
O-KDQ34	-	-	-	-	-	1	2	1	-	-	-	-	2	1	-
O-KDS35	5	-	-	-	-	-	3	-	1	-	-	-	1	3	1
O-KDZ57	3	-	8	1	1	-	1	11	-	-	-	1	1	27	-
O-KDZ58	1	-	9	-	2	1	1	8	-	-	-	-	-	30	-
O-KDP69	1	-	15	5	-	1	-	-	-	-	-	9	7	11	-
O-KDB78	4	-	-	19	-	5	18	10	-	-	-	3	-	12	-

O-KDE86	10	-	-	11	-	-	-	8	-	-	-		-	12	-
O-KDE89	2	-	-	3	2	2	2	-	-	-	4	7	7	10	2
O-NDM97	-	-	3	7	5	-	7	3	-	-	-	10	12	-	-
O-NDM98	2	-	-	18	9	-	12	10	-	-	-	25	30	35	25
O-NDM99	2	-	8	5	-	-	12	7	-	-	-	10	-	15	13
O-NDM100	10	-	-	3	4	1	-	5	2	-	-	8	-	4	7
O-TKK111	5	-	2	-	-	4	8	10	-	-	-		7	22	11
O-TKK112	6	-	6	3	-	-	9	-	-	-	-	10	2	-	21
O-TKK114	-	-	-	-	-	-	-	-	-	-	-	5	12	-	6
O-TKK115	-	-	-	-	-	-	-	-	-	-	-	3	6	-	5
O-TKK116	-	-	-	2	-	7	5	3	-	-	-	7	-	11	3
O-KDZ117	5	-	2	-	-	-	-	-	-	-	2	5	2	20	4
O-KDZ124	7	-	-	15	-	-	-	6	-	-	-		-	20	-
O-KDZ125	4	-	-	10	-	5	6	-	-	-	-	3	8	12	-

Data is based on 100 cm^3 soil samples taken from olive yards.

Table 21. The number of free living (bacterivorous and fungivorous) nematodes found in grapes yards from northern Iraq in 2014-2015.

Sample Code	Free Living Nematodes: Bacterivorous											Fungivorous			
	Monhystera	*Wilsonema*	*Rhabditis*	*Acrolobus*	*Acrobeles*	*Chiloplacus*	*Cephalobus*	*Eucephalobus*	*Amphidelus*	*Cervidellus*	*Panagrolaimus*	*Aphelenchus*	*Aphelenchoides*	*Tylenchus*	*Ditylenchus*
G-KDZ5	5	-	-	-	-	-	-	-	-	-	-	-	3	-	2
G-KDZ7	1	-	1	-	-	-	-	-	-	-	1	-	-	-	1
G-KDG9	3	-	-	-	-	-	-	-	-	-	-	-	-	-	2
G-KDQ10	-	-	-	-	-	-	-	-	-	-	-	1	-	-	2
G-KDS12	3	-	1	-	-	-	-	-	-	-	-	-	2	-	3
G-KDB13	2	-	2	-	-	-	-	-	-	-	-	-	4	-	-
G-KDB14	1	-	1	-	-	-	-	-	-	-	-	-	2	-	5
G-KDB15	1	-	-	-	-	-	-	-	-	-	-	1	5	-	6
G-KDZ16	1	-	-	-	-	-	-	-	-	-	-	-	3	-	3
G-KDZ17	1	-	-	-	-	-	-	-	-	-	-	-	2	-	3
G-KDQ18	2	-	-	-	-	-	-	-	-	-	-	-	6	-	5
G-KDQ19	-	-	1	-	-	-	-	-	-	-	-	-	5	-	3
G-KDD21	-	-	-	2	2	2	2	1	-	-	-	-	-	8	6

G-KDD22	-	-	-	-	1	11	-	6	-	-	-	5	-	1	-
G-KDB24	2	-	-	-	1	8	5	9	-	-	-	7	-	4	2
G-KDB25	1	-	-	-	1	1	8	1	-	-	-	9	1	4	-
G-KDP27	-	-	-	-	-	-	-	1	-	-	-	-	-	2	-
G-KDB29	2	-	-	-	-	-	6	-	-	-	-	6	-	-	-
G-KDR30	1	-	-	-	-	2	2	-	-	-	-	-	-	-	-
G-KDG36	1	-	-	-	-	-	1	-	-	-	-	-	-	1	-
G-KD37	1	-	-	-	-	-	4	6	-	-	-	-	6	1	1
G-KDP38	-	-	-	-	-	1	1	1	-	-	-	1	-	2	-
G-KDB39	-	-	-	-	-	-	4	-	-	-	-	3	-	-	-
G-KDL40	-	-	-	-	-	-	3	-	-	-	-	1	1	-	-
G-KDB41	8	-	-	-	1	-	9	1	-	-	-	7	6	-	-
G-KDB42	-	-	-	-	-	-	2	-	-	-	-	16	4	5	-
G-KDB43	3	-	-	-	-	-	7	-	-	-	-	8	3	5	-
G-KDB44	1	-	18	-	-	1	14	1	-	-	-	8	5	2	-
G-KDB45	7	-	10	-	1	-	6	1	-	-	-	11	4	4	-
G-KDB46	1	-	-	3	-	1	6	1	-	-	-	11	3	9	-
G-KDB47	4	-	-	-	8	-	1	-	-	-	-	2	6	5	-
G-KDB48	1	-	-	-	25	30	18	-	-	-	-	18	15	12	-
G-KDB49	3	-	-	5	32	6	12	13	-	-	-	11	6	5	-
G-KDB51	11	-	-	32	7	8	8	-	-	-	-	20	37	13	-
G-KDB52	22	-	1	17	-	-	11	11	-	-	-	3	12	29	-
G-KDB53	10	-	4	11	-	-	6	-	-	-	-	5	8	35	-

G-KDB54	5	-	2	32	-	-	14	5	-	-	-	17	15	31	-
G-KDB56	4	-	5	1	-	3	1	1	-	-	-	1	1	5	-
G-KDZ59	2	-	-	3	1	-	6	10	2	-	-	1	2	35	-
G-KDG61	3	-	4	6	-	-	1	41	-	-	-	3	7	18	-
G-KDG64	8	-	3	6	-	3	4	3	4	-	-	13	19	23	-
G-KDB65	1	-	-	5	-	-	3	2	2	-	-	-	13	10	-
G-KDB66	1	-	7	15	-	-	-	3	-	-	-	8	-	10	-
G-KDB67	1	-	-	-	19	-	7	10	2	-	-	13	31	17	-
G-KDB68	5	-	-	9	-	4	4	-	-	-	-	12	4	13	-
G-KDP70	-	-	-	9	-	-	2	-	-	-	-		7	3	-
G-KDB71	-	1	15	15	-	7	19	17	1	-	-	27	11	10	-
G-KDB72	11	10	-	8	-	3	7	-	-	-	-	10	8	13	-
G-KDB73	-	-	11	12	-	-	7	10	1	-	-	8	14	13	9
G-KDB74	-	-	-	1	-	-	21	9	-	-	-	4	-	7	-
G-KDB75	14	-	5	2	-	6	7	12	-	-	-	-	-	4	-
G-KDB76	12	-	-	11	-	7	25	15	-	-	-	10	6	15	10
G-KDB77	1	-	-	7	-	2	2	-	-	-	-	-	1	5	3
G-KDB79	-	-	-	8	-	-	5	-	-	-	-	3	-	7	-
G-KDB80	8	-	-	-	-	-	-	5	-	-	-	-	-	-	-
G-KDE81	9	-	-	6	3	-	7	-	-	-	-	4	8	10	1
G-KDE82	-	4	-	11	9	-	-	-	-	1	-	7	8	18	-
G-KDE83	10	9	-	-	19	5	11	17	-	1	-	10	12	20	-
G-KDE84	20	-	-	10	28	10	23	23	-	-	-	16	-	10	-

G-KDE87	4	-	-	7	-	13	5	-	-	-	-	8	-	3	-
G-KDE88	3	-	5	3	1	-	-	4	-	-	-	3	2	7	10
G-KDM91	10	-	-	5	3	-	11	-	-	-	-	5	-	7	3
G-KDM92	8	-	3	5	3	1	7	7	3	-	-	11	10	9	-
G-KDM93	5	-	2	5	-	-	-	-	-	-	-	10	5	3	7
G-KDM94	6	-	5	2	5	-	10	-	-	-	-	10	-	13	-
G-KDM95	8	-	-	20	2	3	6	2	-	-	-	5	2	22	6
G-NDM101	-	9	10	11	-	-	5	-	-	-	-	18	-	22	-
G-NDM102	4	2	2	5	-	-	4	-	-	-	-	6	-	4	-
G-NDM103	3	-	-	12	7	-	4	4	-	-	-	4	8	3	2
G-NDM105	9	-	11	3	6	-	-	12	-	-	-	5	8	9	4
G-NDD106	7	-	6	5		3	3	-	2	-	-	8	9	10	6
G-NDD107	2	-	7	3	5	5	7	3	-	-	-	6	-	4	3
G-NDD108	9	3	10	-	7	-	8	11	-	-	-	-	5	10	7
G-NDD109	18	-	22	-	8	-	16	8	-	-	-	23	-	13	-
G-NDD110	3	2	-	17	5	-	-	12	-	1	-	3	9	-	-
G-KDZ118	-	9	6	2	-	-	5	-	-	-	-	8	-	10	-
G-KDZ119	-	-	-	-	1	11	-	6	-	-	-	7	-	9	-
G-KDZ120	-	-	-	8	-	-	5	-	-	-	-	3	-	17	-
G-KDZ121	8		6	6	2			3			-	5	8	9	4
G-KDZ122	-	-	4	11	9	-	-	-	-	3	-	7	8	6	-
G-KDZ123	-	-	-	-	8	5	-	10	-	-	-	3	-	9	-

Data is based on 100 cm^3 soil samples taken grapes yards.

Table 22. The number of free living (bacterivorous and fungivorous) nematodes found in mixed fruits yards from Northern Iraq in 2014-2015.

Free Living Nematodes

Sample Code	Bacterivorous nematodes										Fungivorous nematodes				
	Monhystera	*Wilsonema*	*Rhabditis*	*Acrolobus*	*Acrobeles*	*Chiloplacus*	*Cephalobus*	*Eucephalobus*	*Amphidelus*	*Cervidellus*	*Panagrolaimus*	*Aphelenchus*	*Aphelenchoides*	*Tylenchus*	*Ditylenchus*
M-KDS2	7	-	3		1	-	-	-	-	-	-	4	1	-	1
M-KDZ6	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
M-KDS11	2	-	-	-	-	-	-	-	-	-	-	-	1	-	3
M-KDB26	-	-	-	-	2	4	2	1	-	-	-	2	5	9	-
M-KDB28	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
M-KDD32	-	-	-	-	-	-	1	1	1	-	-	-	-	20	-
M-KDA33	2	-	-	-	1	-	-	-	-	-	-	1	1	2	-
M-KDB50	-	-		17	4	-	4	40	-	-	-	2	11	14	-
M-KDB55	7	-	12	2	3	1	2	-	-	-	-	7	18	37	-
M-KDG60	16	-	6	-	1	-	7	19	-	-	-	9	1	24	-
M-KDG62	3	-	38	3	-	-	5	5	-	-	-	2	8	-	-
M-KDG63	15	-	3	12	1	-	-	14	-	-	-	13	36	12	-
M-KDE85	8	-	-	4	3	7	-	3	-	-	-	10	-	13	7
M-KDM90	5	-	5	2	-	5	-	3	-	-	-	11	-	3	-

M-KDM96	-	-	-	5	-	-	-	5	-	-	-	5	13	23	25
M-NDM104	3	-	7	-	17	-	-	5	-	-	-	12	-	-	16
M-TKK113	10	1	1	6	-	4	-	2	-	-	-	6	6	3	6

Data is based on 100 cm^3 soil samples taken from mixed fruits fields.

Table 23: The number of predacious nematodes found in olive yards from northern Iraq in 2014-2015.

	Predacious Nematodes					
Sample Code	*Labronema*	*Eudorylaimus*	*Discolaimus*	*Aprocelaimus*	*Senura*	*Monunchus*
O-KDS1	5	2	-	-	-	-
O-KDS3	1	1	-	-	1	-
O-KDS4	1	1	-	-	1	-
O-KDG8	-	-	2	-	2	-
O-KDQ20	-	-	-	-	2	-
O-KDD23	-	-	-	-	-	-
O-KDD31	-	-	-	-	-	-
O-KDQ34	-	-	-	-	-	-
O-KDS35	-	-	-	-	-	-
O-KDZ57	2	5	-	-	-	1
O-KDZ58	4	1	-	-	-	1
O-KDP69	7	-	-	-	-	-
O-KDB78	-	-	-	-	-	-
O-KDE86	5	7	-	-	-	-
O-KDE89	-	5	-	-	-	-
O-NDM97	6	2	-	-	-	-
O-NDM98	5	13	-	-	-	-
O-NDM99	2	11	-	-	-	-
O-NDM100	3	6	-	-	-	-

O-TKK111	9	6	-	-	-	5
O-TKK112	6	5	-	-	-	1
O-TKK114	-	-	-	-	-	-
O-TKK115	-	-	-	-	-	-
O-TKK116	4	11	-	-	-	3
O-KDZ117	-	-	2	-	2	-
O-KDZ124	2	7	-	-	-	-
O-KDZ125	-	5	-	-	-	-

Data is based on 100 cm^3 soil samples taken from olive yards.

Table 24. The number of predaceous nematodes found in grapes yards from northern Iraq in 2014-2015.

	Predacious Nematodes					
Sample Code	***Labronema***	***Eudorylaimus***	***Discolaimus***	***Aprocelaimus***	***senura***	***Monunchus***
G-KDZ5	2	2	-	-	1	-
G-KDZ7	-	-	-	-	3	-
G-KDG9	-	2	-	-	4	-
G-KDQ10	-	2	-	-	2	-
G-KDS12	-	-	-	-	-	-
G-KDB13	-	-	-	-	-	-
G-KDB14	1	-	-	-	1	-
G-KDB15	-	1	-	-	1	-
G-KDZ16	4	2	-	-	2	-
G-KDZ17	-	-	-	-	-	-
G-KDQ18	2	2	-	-	-	-
G-KDQ19	-	-	1	-	2	-
G-KDD21	-	1	-	-	-	-
G-KDD22	-	1	-	-	-	-
G-KDB24	-	1	-	-	-	-
G-KDB25	-	7	-	-	-	-
G-KDP27	-	1	-	-	-	-
G-KDB29	-	7	1	-	-	-
G-KDR30	-	-	-	-	-	-

G-KDG36	-	-	-	-	-	-
G-KD37	-	-	-	-	-	-
G-KDP38	-	-	-	-	-	-
G-KDB39	-	-	-	-	-	1
G-KDL40	-	-	-	-	-	-
G-KDB41	3	4	-	-	-	5
G-KDB42	3	5	-	-	1	6
G-KDB43	3	-	-	-	-	-
G-KDB44	3	1	-	-	-	-
G-KDB45	1	1	-	-	-	9
G-KDB46	1	3	-	-	-	1
G-KDB47	4	1	-	-	-	7
G-KDB48	1	5	-	-	-	-
G-KDB49	1	10	-	-	-	-
G-KDB51	-	26	-	-	-	-
G-KDB52	5	4	-	-	-	11
G-KDB53	3	3	-	-	-	-
G-KDB54	1	23	-	-	-	36
G-KDB56	1	5	-	-	-	4
G-KDZ59	4	8	-	-	-	-
G-KDG61	2	4	7	-	-	1
G-KDG64	3	1	-	-	-	4
G-KDB65	2	3	-	-	-	20

G-KDB66	2	1	-	-	-	1
G-KDB67	-	22	-	-	-	2
G-KDB68	3	14	-	-	-	-
G-KDP70	1	2	-	-	-	-
G-KDB71	5	15	-	-	-	15
G-KDB72	7	16	-	-	-	11
G-KDB73	8	7	-	-	-	18
G-KDB74	1	8	-	-	-	4
G-KDB75	1	5	-	-	-	16
G-KDB76	-	25	-	-	4	-
G-KDB77	4	1	-	-	-	-
G-KDB79	-	-	-	-	-	-
G-KDB80	-	2	-	-	-	-
G-KDE81	7	8	-	-	1	5
G-KDE82	-	7	12	-	-	-
G-KDE83	8	-	-	-	-	6
G-KDE84	-	13	-	-	-	-
G-KDE87	2	-	-	-	-	-
G-KDE88	-	-	2	-	2	5
G-KDM91	5	8	-	-	-	8
G-KDM92	4	4	-	-	-	3
G-KDM93	-	3	-	-	-	5
G-KDM94	5	2	-	-	-	-

G-KDM95	-	9	-	-	-	-
G-NDM101	1	15	-	-	-	6
G-NDM102	-	-	-	-	-	-
G-NDM103	6	2	-	-	-	9
G-NDM105	3	5	-	-	-	2
G-NDD106	5	4	-	-	-	2
G-NDD107	5	4	-	-	-	3
G-NDD108	3	7	-	-	-	2
G-NDD109	10	18	-	-	-	10
G-NDD110	2	12	-	-	-	2
G-KDZ118	1	3	-	-	-	6
G-KDZ119	-	3	-	-	-	-
G-KDZ120	-	-	-	-	-	-
G-KDZ121	3	4	-	-	-	8
G-KDZ122	-	7	12	-	-	-
G-KDZ123	-	8	-	-	-	-

Data is based on 100 cm^3 soil samples taken from grapes fields.

Table 25. The number of predaceous nematodes found mixed fruits yards from northern Iraq in 2014-2015.

	Predacious Nematodes					
Sample Code	*Labronema*	*Eudorylaimus*	*Discolaimus*	*Aprocelaimus*	*Senura*	*Monunchus*
M-KDS2	1	-	-	-	1	-
M-KDZ6	-	-	1	-	-	-
M-KDS11	-	2	-	-	-	-
M-KDB26	-	2	-	-	-	-
M-KDB28	-	-	-	-	-	-
M-KDD32	1	-	-	-	-	2
M-KDA33	-	1	-	-	-	-
M-KDB50	-	-	-	-	-	1
M-KDB55	6	11	-	-	-	7
M-KDG60	8	9	-	-	-	7
M-KDG62	3	5	-	-	-	5
M-KDG63	5	-	-	-	-	1
M-KDE85	6	2	-	-	2	-
M-KDM90	6	2	2	-	-	6
M-KDM96	-	20	-	-	-	-
M-NDM104	18	13	-	-	-	2
M-TKK113	-	5	-	-	-	-

Data is based on 100 cm^3 soil samples taken from found mixed fruits yards.

Table 26. The number of omnivorous nematodes found in olive yards from northern Iraq in 2014-2015.

	Omnivorous Nematodes					
Sample Code	*Labronema*	*Eudorylaimus*	*Ecumenicus*	*Aprocelaimus*	*Mesodorylaimus*	*Dorylaimus*
O-KDS1	5	2	-	-	-	-
O-KDS3	1	1	-	-	-	-
O-KDS4	-	1	-	-	-	-
O-KDG8	-	-	-	-	-	-
O-KDQ20	-	-	-	-	-	-
O-KDD23	-	-	-	-	-	-
O-KDD31	-	-	-	-	-	-
O-KDQ34	-	-	-	-	-	-
O-KDS35	-	-	-	-	-	-
O-KDZ57	2	5	-	-	-	-
O-KDZ58	4	1	-	-	-	-
O-KDP69	7	-	-	-	-	-
O-KDB78	-	-	-	-	-	-
O-KDE86	5	7	-	-	-	-
O-KDE89	-	5	-	-	-	-
O-NDM97	6	2	-	-	-	-
O-NDM98	5	13	-	-	-	-
O-NDM99	2	11	-	-	-	3

O-NDM100	3	6	-	-	-	-
O-TKK111	9	6	2	-	-	-
O-TKK112	-	-	-	-	-	-
O-TKK114	7	5	-	-	-	-
O-TKK115	-	-	-	-	-	-
O-TKK116	4	11	-	-	2	-
O-KDZ117	-	-	-	-	-	-
O-KDZ124	2	7	-	-	-	-
O-KDZ125	-	5	-	-	-	-

Data is based on 100 cm^3 soil samples taken from olive fields.

Table 27. The number of omnivorous nematodes found in grapes yards from northern Iraq in 2014-2015.

	Omnivorous Nematodes					
Sample Code	*Labronema*	*Eudorylaimus*	*Ecumenicus*	*Aprocelaimus*	*Mesodorylaimus*	*Dorylaimus*
G-KDZ5	2	2	-	-	-	-
G-KDZ7	-	-	-	-	-	-
G-KDG9	-	2	-	-	-	-
G-KDQ10	-	2	-	-	-	-
G-KDS12	-	-	-	-	-	-
G-KDB13	-	-	-	-	-	-
G-KDB14	1	-	-	-	-	-
G-KDB15	-	1	-	-	-	-
G-KDZ16	4	2	-	-	-	-
G-KDZ17	-	-	-	-	-	-
G-KDQ18	2	2	-	-	-	-
G-KDQ19	-	-	-	-	-	-
G-KDD21	-	1	-	-	-	-
G-KDD22	-	1	-	-	-	-
G-KDB24	-	1	-	-	-	-
G-KDB25	-	7	-	-	-	-

G-KDP27	-	1	-	-	-	-
G-KDB29	-	7	-	-	-	-
G-KDR30	-	-	-	-	-	-
G-KDG36	-	-	-	-	-	-
G-KD37	-	-	-	-	-	-
G-KDP38	-	-	-	-	-	-
G-KDB39	-	-	-	-	-	-
G-KDL40	-	-	-	-	-	-
G-KDB41	3	4	-	-	-	1
G-KDB42	3	5	-	-	-	-
G-KDB43	3	-	-	-	-	-
G-KDB44	3	1	-	-	-	-
G-KDB45	1	1	-	-	-	-
G-KDB46	1	3	-	-	-	-
G-KDB47	4	1	-	-	-	-
G-KDB48	1	5	-	-	-	-
G-KDB49	1	10	-	-	-	-
G-KDB51	-	26	-	-	-	3
G-KDB52	5	4	-	-	-	-
G-KDB53	3	3	-	-	-	-
G-KDB54	1	23	-	-	-	-

G-KDB56	1	5	-	-	-	-
G-KDZ59	4	8	-	-	-	-
G-KDG61	2	4	-	-	-	-
G-KDG64	3	1	-	-	-	-
G-KDB65	2	3	-	-	-	-
G-KDB66	2	1	-	-	-	-
G-KDB67	-	22	-	-	-	-
G-KDB68	3	14	-	-	-	-
G-KDP70	1	2	-	-	-	-
G-KDB71	5	15	-	-	-	-
G-KDB72	7	16	-	-	-	-
G-KDB73	8	7	-	-	-	-
G-KDB74	1	8	-	-	-	-
G-KDB75	1	5	-	-	-	-
G-KDB76	-	25	-	-	-	-
G-KDB77	4	1	-	-	-	-
G-KDB79	-	-	-	-	-	-
G-KDB80	-	2	-	-	-	-
G-KDE81	7	8	-	-	-	-
G-KDE82	-	7	-	-	-	-
G-KDE83	8	-	-	-	-	-

G-KDE84	-	13	-	-	-	-
G-KDE87	2	-	-	-	-	-
G-KDE88	-	-	-	-	-	-
G-KDM91	5	8	-	-	-	3
G-KDM92	4	4	-	-	-	6
G-KDM93	-	3	-	-	-	-
G-KDM94	5	2	-	-	-	3
G-KDM95	-	9	-	-	-	-
G-NDM101	1	15	-	-	-	-
G-NDM102	-	-	-	-	-	2
G-NDM103	6	2	-	-	-	-
G-NDM105	3	5	-	-	-	-
G-NDD106	5	4	-	-	-	2
G-NDD107	5	4	-	-	-	-
G-NDD108	3	7	-	-	-	-
G-NDD109	10	18	-	-	-	-
G-NDD110	2	12	-	-	-	-
G-KDZ118	1	3	-	-	-	-
G-KDZ119	-	3	-	-	-	-
G-KDZ120	-	-	-	-	-	-
G-KDZ121	3	4	-	-	-	-

G-KDZ122	-	7	-	-	-	-
G-KDZ123	-	8	-	-	-	-

Data is based on 100 cm^3 soil samples taken from grapes fields.

Table 28. The number of omnivorous nematodes found mixed fruits yards from northern Iraq in 2014-2015.

			Omnivorous Nematodes			
Sample Code	*Labronema*	*Eudorylaimus*	*Ecumenicus*	*Aprocelaimus*	*Mesodorylaimus*	*Dorylaimus*
M-KDS2	1	-	-	-	-	-
M-KDZ6	-	-	-	-	-	-
M-KDS11	-	2	-	-	-	-
M-KDB26	-	2	-	-	-	-
M-KDB28	-	-	-	-	-	-
M-KDD32	1	-	-	-	-	-
M-KDA33	-	1	-	-	-	-
M-KDB50	-	-	-	-	-	-
M-KDB55	6	11	-	-	-	-
M-KDG60	8	9	-	-	-	-
M-KDG62	3	5	-	-	-	-
M-KDG63	5	-	-	-	-	-
M-KDE85	6	2	-	-	-	-
M-KDM90	6	2	-	-	-	2
M-KDM96	-	20	-	-	-	-
M-NDM104	18	13	-	-	-	-
M-TKK113	-	5	2	-	-	2

Data is based on 100 cm^3 soil samples taken from mixed fruits fields.

Table 29. The mean number of plant parasitic nematodes found in olive, grape and mixed fruits in south of Turkey and north of Iraq in 2014-2015.

Crops	Plant Parasitic Nematodes										
	Aphelenchus	*Aphelenchoides*	*Pratylenchus*	*Paratylenchus*	*Tylenchus*	*Ditylenchus*	*Xi phenema*	*Helicotylenchus*	*Hemicycliophora*	*Meloidogyne*	*Filenchus*
						South of Turkey					
Olives	6.94 ab	4.07 bc	7.98 a	1.07 c	10.75 a	5.00 a	0.02 a	5.28 a	0.01 a	1.14 b	0.17 a
Grapes	5.35 b	3.23 c	5.91 b	1.02 c	6.52 c	4.02 ab	0.05 a	2.11 bc	0.02 a	0.44 c	0.23 a
Mixed fruits	7.80 a	5.45 ab	8.25 a	1.25 c	10.11a	5.40 a	0.02 a	3.34 b	0.00 a	1.14 b	0.14 a
						North Iraq					
Olives	4.11 c	3.66 c	3.11 bc	3.37 a	9.14 ab	4.11 ab	0.00 a	1.11 c	0.00 a	0.48 c	0.00 b
Grapes	5.91b	4.81 b	1.91 c	2.64 b	7.93 b	1.46 c	0.01 a	0.54 c	0.00 a	2.56 b	0.00 b
Mixed fruits	4.94 bc	5.94 a	2.82 bc	0.88 c	9.41 ab	3.41 b	0.00 a	0.52 c	0.00 a	3.05 a	0.00 b

Data are an average of nematode numbers per sample. Actual numbers are presented. Means within a column followed by the same letter are not different according to Duncan's multiple-range test ($P \leq 0.05$).

Table 30. The mean number of free living nematodes found in olive, grape and mixed fruits in south of Turkey and north of Iraq in 2014-2015.

Crops	Free living nematodes: Bacterivorous									Fungivorous					
	Monhystera	*Wilsonema*	*Rhabditis*	*Acrolobus*	*Acrobeles*	*Chiloplacus*	*Cephalobus*	*Eucephalobus*	*Amphidelus*	*Cervidellus*	*Panagrolaimus*	*Aphelenchus*	*Aphelenchoides*	*Tylenchus*	*Ditylenchus*
South of Turkey															
Olives	7.37 a	1.51 a	0.76 c	6.94 a	1.69 b	1.91 a	3.69 b	4.96 a	0.03 c	0.07 a	0.01 b	6.94 a	4.07 b	10.75 a	5.00 a
Grapes	6.73 ab	0.50 b	2.00 b	4.88 b	0.73 c	2.17 a	3.05 b	2.82 c	0.02 c	0.00 a	0.32 a	5.35 ab	3.23 b	6.52	4.02 ab
Mixed fruits	7.94 a	0.51 b	1.48 bc	6.54 a	1.28 bc	1.37 b	3.51 b	5.34 a	0.94 a	0.02 a	0.05 b	7.80 a	5.45 a	10.11 a	5.40 a
North of Iraq															
Olives	3.29 c	0.00 c	2.11 b	3.77 bc	0.92 c	1.18 b	3.22 b	3.03 c	0.11 c	0.00 a	0.29 a	4.11 b	3.66 b	9.14 a	4.11 ab
Grapes	3.96 bc	0.60 b	2.34 b	4.65 b	2.83 a	2.00 a	5.03 a	3.92 b	0.20 b	0.07 a	0.01 b	5.91 ab	4.81ab	7.93 b	1.46 c
Mixed fruits	4.76 b	0.05 c	4.41 a	3.00 c	1.94 b	1.23 b	1.23 c	5.76 a	0.05 c	0.00 a	0.00 b	4.94 b	5.94 a	9.41 b	3.41 b

Data are an average of nematode numbers per sample. Actual numbers are presented. Means within a column followed by the same letter are not different according to Duncan's multiple-range test ($P \leq 0.05$).

Table 31. The mean number of predacious nematodes found in olive, grape and mixed fruits in south of Turkey and north of Iraq in 2014-2015.

	Predacious Nematodes					
Crops	*Labronema*	*Eudorylaimus*	*Discolaimus*	*Aprocelaimus*	*Sienura*	*Mononchus*
	South of Turkey					
Olives	3.10 b	5.53 b	0.71 a	0.37 a	0.09 c	1.21 b
Grapes	3.79 ab	4.44 bc	0.14 c	0.20 b	0.08 c	0.70 c
Mixed Fruits	4.88 a	8.28 a	0.31 bc	0.14 b	0.00 c	1.85 b
	North of Iraq					
Olives	2.29 bc	3.25 c	0.14 c	0.00 c	0.29 a	0.40 c
Grapes	1.87 c	4.93 bc	0.43 b	0.00 c	0.29 a	3.13 a
Mixed fruits	3.17 b	4.23 bc	0.17 c	0.00 c	0.17 b	1.82 b

Data are an average of nematode numbers per sample. Actual numbers are presented. Means within a column followed by the same letter are not different according to Duncan's multiple-range test ($P \leq 0.05$).

Table 32. The mean number of omnivorous nematodes found in olive, grape and mixed fruits in south of Turkey and north of Iraq in 2014-2015.

	Omnivorous Nematodes					
Crops	*Labronema*	*Eudorylaimus*	*Ecumenicus*	*Aprocelaimus*	*Mesodorylaimus*	*Dorylaimus*
			South of Turkey			
Olives	3.10 b	5.53 b	0.85 a	0.46 a	0.07 b	0.57 a
Grapes	3.79 b	4.44 bc	0.32 b	0.20 b	0.00 b	0.70 a
Mixed fruits	4.88 a	8.28 a	0.97 a	0.14 b	1.11 a	0.74 a
			North of Iraq			
Olives	2.29 bc	3.25 c	0.07 c	0.00 c	0.07 b	0.11 b
Grapes	1.87 c	4.93 b	0.00 c	0.00 c	0.00 b	0.24 b
Mixed fruits	3.17 b	4.23 bc	0.11 c	0.00 c	0.00 b	0.23 b

Data are an average of nematode numbers per sample. Actual numbers are presented. Means within a column followed by the same letter are not different according to Duncan's multiple-range test ($P \leq 0.05$).

4.2. Discussion

In this study the distributions of many economically and ecologically important nematode species were mapped, and degrees of aggregation were explored. Sampling strategies, the spatial analysis and nematode distributions in the field similar to that reported by (Neher et al., 1992; Neher et al., 2005; Zhang et al., 2012). Soil samples were thoroughly taken for nematode extraction by using Cobb's sieving and decanting technique followed by a modified Baermann technique (Hooper et al., 2005). Studies on nematode community structure in cultivated soils indicated that nematodes are one of the most numerous components of the micro fauna of agricultural soils (Boagand Yeates, 1998). The most current nematode ecological information is survey-based or purely observational in nature, with a persistent focus on detailed taxonomic analysis of nematode communities.

The size distribution of individuals within the community is likely also to be an indicator of the structural status of soils from a biotic stand point (Ritz and Trudgill, 1999). The distribution of many soil nematode taxa has been found to be strongly influenced by factors such as soil texture (Hunt, 1993), soil temperature (Boag et al., 1991) and broad vegetation types (grasses versus woody plants) (Boagand Orton Williams, 1976).

Incurrent study, the genera and species of nematodes identified in three different crops types from two different countries were determined. Overall, there were no great differences of obtained data between southern Turkey and northern Iraq. Being located in the same geographic and climatic region makes probably these two countries similar in nematode biodiversity as well. Therefore, it is not surprising that nematode communities varied among regions, and it may be necessary to base interpretation of index values according to region or ecosystem type (Ruess, 2003). It was reported that rainfall is the main influence on the nematode and its species population densities. In current study, most of soil samples were taken in the dry season, which influenced the total number of nematodes extracted from soil. Founding on this matter was corresponded with those of Sarah, (1989).

The total number of plant parasitic nematodes found in all surveyed crops in Turkey was greater than the data obtained from Iraq. Overall in Turkey, the plant parasitic nematodes that found in genus *Aphelenchus* were 389, 182 and 273 individual for olive, grapes and mixed fruits, respectively. Overall, In Iraq, the highest numbers of plant parasitic nematodes were found in genus *Aphelenchus* with 111, 479 and 84 individual for olive, grapes and mixed fruits, respectively. The genera *Aphelenchoides* in Turkey sustained nematode number of 228, 110, and 191 for olive, grapes and mixed fruits, respectively. The genera *Aphelenchoides* in Iraq also sustained nematode number of 99, 390, and 101 for olive, grapes and mixed fruits, respectively. In the case of *Pratylenchus*, Turkey showed for 447, 201, and 289 olive, grapes and mixed fruits, respectively. The genus *Pratylenchus* in Iraq revealed 84, 155, and 48 individual olive, grapes and mixed fruits, respectively. When It is compared between two countries, the number of *Paratylenchus* detected in olive found in Iraq was greater (91) than those of Turkey (60). For the same genera, in grapes, Turkey contained 35 and Iraq sustained 214 individual nematodes, but in mixed fruits, Turkey persisted 44 and Iraq had 15 individual. In Turkey the dominant genus in the study was *Tylenchus* with total of 602, 222, and 354 individuals for olive, grape and mixed fruits, respectively. In Iraq number of *Tylechus* was relatively low showing 247, 643, and 160 for olive, grape and mixed fruits, respectively. *Ditylenchus* show rather higher values in Turkey than those of Iraq. The highest number of *Ditylenchus* was found in olive groves of in Turkey (280) and the lowest was in the mixed fruits of Iraq. One of another genera obtained from our study was *Helicotylenchus* which contained the highest numbers of 296 in olive grove of Turkey and the lowest of only 9 in mixed fruits grove of Iraq. Indeed, the abundance of *Meloidogyne* nematodes in olive, grape and mixed fruits was 64, 15, and 40 individual for Turkey (Table. 5, 6, and 7) and 13, 208 and 52 individuals for Iraq (Table. 17, 18, and 19). This entire plant parasitic genus that has been founded in high density in the current study is accordance with that obtained by Foucher et al., (2004). In a surveys conducted by taking a soil samples taken from Scotland and Netherlands coastal pasture soils, inland pasture, and arable soil, Forrest and Garden. Also the number of nematode genus that they obtained also was similar with ours.

Conversely, the genus *Xiphinema* was found in very low density in two sites (olive and mixed fruits) and only 2 individuals in grapes of Turkey. *Hemicycliophora* was found in very few in Turkey. Overall in Turkey, the total of *Filenchus* found was 10, 8 and 5 for olives, grapes, and mixed fruits, respectively. None of latter genus found in Iraq, also stated by Neher et al. (2005). By extracting nematode communities from soils in relatively undisturbed and disturbed wetland, forest and agricultural soils in (coastal plain, piedmont and mountain) in North Carolina, their found out that almost identical results (Neher et al., 2005)

Free living nematodes were the other abundant nematode groups in our results including the bacterial-feeding nematodes such as Cephalobidae. This genus was often also observed by (Yeates, 2003) as we found in Turkey as well. The highest number of *Monhystera* was found in olive of Turkey (413), and grapes of Iraq (321) among all three crops. The highest number of genera *Acrolobus* in Turkey sustained in olives with 389 and in Iraq with 377 in grapes. Overall in Turkey, the number of genus *Eucephalobus* were 278, 96 and 187 individuals for olive, grapes and mixed fruits, respectively. In Iraq, however, the genus *Eucephalobus* sustained 82, 318 and 98 individuals for olive, grapes and mixed fruits, respectively. This result for these particular genera (*Eucephalobus*) was lower than those of reported by Cerevková and Cagáň, (2012) in maize field at Komoča in southwest region of Slovakia. However, our results of the same genus were aligned with those of Brmež et al., (2006). Brmež et al., (2006) study was focused on quantification and identification of nematodes and differences in nematode community structures by comparing two tillage regimes (standard tillage and no tillage) in arable land, without vegetation, arable land, and winter wheat.

A study conducted by McSorley and Frederick, (1996) on nematodes communities in soybean in Florida, U.S., revealed the same results with ours regarding obtaining high numbers of *Acrobeles* (95 from olive, 25 from grapes and 45 from mixed fruits) in Turkey and (25 for olive, 230 for grapes and 33 for mixed fruits) in Iraq. The density of *Rhabditis* for Turkey (43, 68 and 52 for olive grapes and mixed fruits, respectively) and for Iraq (57, 190 and 75 for olive, grape and mixed fruits, respectively) were almost similar. The highest number of *Wilsonema* densities was found in olive of Turkey (85) and grapes (49) of Iraq. Whereas, *Chiloplacus* numbers from Turkey were 107, 74 and 48 and from Iraq 32, 162 and 21 for olive, grape and mixed fruits, respectively (Table 20, 21, and 23). The numbers of *Amphidellus* among bacteriovours free living nematodes were found in very low density as previously reported by Renčo et al. (2010). Total of four individuals of genus *Cervidelus* from olive and one individual from mixed fruits of Turkey were observed. Bao et al. (2011) reported similar results from vegetable (tomato, green bean and lettuce) farms among Vermont counties. Some genus were founded in one site and were absent in another. For instance, *Aprocelaimus* was not founded in Iraq, but it was present in Turkey with numbers of 26, 7 and 5 for olive, grape and mixed fruits, respectively. Ferris et al. (2004) reported low numbers of these genera in cover crops of California, Mediterranean, and Australia as was in our study.

Bacterial and fungal feeders, plant parasites were the functional groups that comprise most of nematodes in most ecosystems noticed by (Moreira et al., 2006), which have similarity with our results.

In the case of *Labronema*, Turkey showed 174, 129 and 171, and Iraq showed 62, 152 and 54 individuals associated with olive, grape and mixed fruits, respectively. While the numbers of *Eudorylaimus* from Turkey were 310, 151 and 290 from Iraq were 88, 400 and 72 for olive, grape and mixed fruits, respectively. The highest number of *Mononchus* was observed in grapes of Iraq with 254 nematodes in all three crops in both countries.

5. Conclusion

In current study, genera belonging to different nematodes trophic groups from olive, grapes and mixed fruits groves soils of different parts of two countries were presented. Four trophic groups of nematodes including plant parasitic, free living, predaceous and omnivorous were identified from soil samples collected related sites. Total of 11 genera of plant parasitic nematodes, 15 genera of free living nematodes, 6 genera of predacious nematodes and also 6 genera of omnivorous nematodes were detected from both countries. In the study, the greatest nematode densities in all three crops from both counties were found in genus *Aphelenchus* followed by *Aphelenchoides*, *Pratylenchus*, *Paratylenchus*, *Tylenchus*, *Ditylenchus*, *Helicotylenchus*, *and Meloidogyne.* On the other hand, the lower densities were observed in genus *Filenchus*, *Hemicycliophora*, *Xiphenema*, and *Criconema.* The higher densities of free-living nematodes were observed in *Monhystera*, *Wilsonema*, *Cephalobus*, *Eucephalobus*, *Cheloplacus*, *Rhabditis* and *Acrolobus.* The greater densities of predacious nematodes were detected in *Eudorylaimus*, *Labronema*, *and Discolaimus,* and the greater density of omnivorous nematodes were retained in genus *Ecuminacus*, *Dorylaimus and Mesodorylaimus.*

Study administered on population density and biodiversity of nematodes found in Turkey and Iraq indicates that the most important feature differentiating between two regions is ecological changes such as soil moistureand and probably the soil texture feflected the number of genera and belonging nematodes. This is clearly one of the most important variables affecting nematode density and trophic composition. However, no significant differences between the two ecological indices were found along the gradient. Plant parasitic and free living nematodes were founded in fairly high densities in both countries' multiyear growing crop sites.

Knowledge about the stratification and population densities of nematodes in this study revealed that northern Iraq soils sustained relatively poor nematode biodiversity as compared to southern Turkey. In the future, more comprehensive, experimentally based and driven studies are needed in both countries with wider crop varieties to learn more of nematode biodiversity population densities in the region.

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APPENDIX

SAMPLES FROM TURKEY

Code	Crop	Locality (Region)	Latitude	Longitude	Hight	Date
O-TKAY1	Olive	Yenice koy Andirin Kahramanmaras	N/35º36'28"	E/36º39'22"	596.2 m	7/2014
G-TKAY2	Grape	Yenice koy Andirin Kahramanmaras	N/37º36'39"	E/36º39'20"	580.5 m	7/2014
G-TKAY3	Grape	Yenice koy Andirin Kahramanmaras	N/37º36'15"	E/36º39'24"	531.1 m	7/2014
M-TKAY4	Mix	Yenice koy Andirin Kahramanmaras	N/37º36"15"	E/36º39'22"	537.5m	7/2014
M-TKAY5	Mix	Yenice koy Andirin Kahramanmaras	N/37º36'15"	E/36º39'23"	537.2 m	7/2014
G-TKAY6	Grape	Yenice koy Andirin Kahramanmaras	N/37º36'13"	E/36º39'21"	547.2 m	7/2014
G-TKAY7	Grape	Yenice koy Andirin Kahramanmaras	N/37º36'53"	E/36º39'27"	537.1 m	7/2014
G-TKAB8	Grape	Baspinar Andırın Kahramanmaras	N/37º37'11"	E/36º39'18"	473.2 m	7/2014
O-TKAB9	Olive	Baspinar Andırın Kahramanmaras	N/37º37'11"	E/36º39'17"	474.6 m	7/2014
G-TKAK10	Grape	Karbasan Andırın Kahramanmaras	N/37º37'11"	E/36º38'59	492.1 m	7/2014
O-TKAK11	Olive	Karbasan Andırın Kahramanmaras	N/37º37'34"	E/36º38'59	493.7 m	7/2014
G-TKAK12	Grape	Karbasan Andırın Kahramanmaras	N/37º37'34"	E/36º38'59	493.7 m	7/2014
G-TKAK13	Grape	Karbasan Andırın Kahramanmaras	N/37º38'25"	E/36º40'11"	506.1 m	7/2014
G-TKAK14	Grape	Karbasan Andırın Kahramanmaras	N/37º38'23"	E/36º40'57"	562.4 m	7/2014
O-TKAK15	Olive	Karbasan Andırın Kahramanmaras	N/37º38'27"	E/36º40'55"	575.1 m	7/2014
G-TKAK16	Grape	Karbasan Andırın Kahramanmaras	N/37º38'16 "	E/36º41'54"	506.9 m	7/2014
M-TKAK17	Mix	Karbasan Andırın Kahramanmaras	N/37º38'17"	E/36º41'56"	505.1 m	7/2014
O-TKAK18	Olive	Karbasan Andırın Kahramanmaras	N/37º38'34"	E/36º45'08"	623.5 m	7/2014
O-TKAK19	Olive	Karbasan Andırın Kahramanmaras	N/37º36'48"	E/36º46'30"	485.4 m	7/2014
M-TK20	Mix	City Center	N/37º35'35"	E/37º35'35"	523.7 m	7/2014
O-TKT21	Olive	Turkoglu kahramanmaras	N/37º23'33"	E/36º50'15"	629m	9/2014
G-TKT22	Grape	Turkoglu kahramanmaras	N/37º23'33"	E/36º50'15"	623m	9/2014
O-TKT23	Olive	Turkoglu kahramanmaras	N/37º23'37"	E/36º49'41"	642m	9/2014
G-TKT24	Grape	Turkoglu kahramanmaras	N/37º23'37"	E/36º49'41"	636m	9/2014
G-TKT25	Grape	Turkoglu kahramanmaras	N/37º23'35"	E/36º49'22"	635m	9/2014
O-TKT26	Olive	Turkoglu kahramanmaras	N/37º23'50"	E/36º48'00"	675m	9/2014
O-TKT27	Olive	Turkoglu kahramanmaras	N/37º23'50"	E/36º48'00"	690m	9/2014
G-TKT28	Grape	Turkoglu kahramanmaras	N/37º23'56"	E/36º47'58"	674m	9/2014
G-TK29	Grape	Turkoglu kahramanmaras	N/37º24'03"	E/36º47'32"	700m	9/2014
M-TK30	Mix	Turkoglu kahramanmaras	N/37º24'03"	E/36º47'32"	700m	9/2014
O-TKY31	Olive	Yenipinar Kahramanmaras	N/37º24'54"	E/36º51'47"	490m	9/2014
O-TKS32	Olive	Saricukur koyu kahramanmaras	N/37º35'54"	E/36º50'24"	575m	4/2015
O-TKS33	Olive	Saricukur koyu kahramanmaras	N/37º35'55"	E/36º50'24"	566m	4/2015
O-TKS34	Olive	Saricukur koyu kahramanmaras	N/37º35'55"	E/36º50'22"	580m	4/2015
O-TKS35	Olive	Saricukur koyu kahramanmaras	N/37º35'54"	E/36º50'22"	570m	4/2015
O-TKS36	Olive	Saricukur koyu kahramanmaras	N/37º35'53"	E/36º50'22"	578m	4/2015
O-TKS37	Olive	Saricukur koyu kahramanmaras	N/37º35'53"	E/36º50'24"	585m	4/2015
O-TKS38	Olive	Saricukur koyu kahramanmaras	N/37º35'50"	E/36º50'24"	590m	4/2015
G-TKS39	Grape	Saricukur koyu kahramanmaras	N/37º36'13"	E/36º49'50"	566m	4/2015
M-TKS40	MIX	Saricukur koyu kahramanmaras	N/37º36'13"	E/36º49'50"	578m	4/2015
G-TKS41	Grape	Saricukur koyu kahramanmaras	N/37º36'10"	E/36º49'48"	578m	5/2015
O-TKC42	Olive	Çamlıca Dağ Evler kahramanmaras	N/37º36'50"	E/36º48'48"	575m	4/2015
G-TKC43	Grape	Çamlıca Dağ Evler kahramanmaras	N/37º36'50"	E/36º48'49"	575m	4/2015
G-TKC44	Grape	Çamlıca Dağ Evler kahramanmaras	N/37º36'50"	E/36º49'49"	575m	4/2015
M-TKC45	Mix	Çamlıca Dağ Evler kahramanmaras	N/37º36'11"	E/36º49'48"	578m	4/2015
O-TKC46	Olive	Çamlıca Dağ Evler kahramanmaras	N/37º36'12"	E/36º49'48"	578m	4/2015
O-TKC47	Olive	Çamlıca Dağ Evler kahramanmaras	N/37º36'11"	E/36º49'49"	577m	4/2015
M-TKC48	Mix	Çamlıca Dağ Evler kahramanmaras	N/37º36'12"	E/36º49'49"	577m	4/2015
M-TK49	Mix	City Center	N/37º36'10"	E/36º48'48"	578m	4/2015
O-TK50	Olive	City Center	N/37º35'48"	E/36º50'56"	562m	4/2015
O-TK51	Olive	City Center	N/37º35'48"	E/36º50'55"	557m	4/2015
O-TK52	Olive	City Center	N/37º35'47"	E/36º50'53"	557m	4/2015
G-TK53	Grape	City Center	N/37º37'66"	E/36º54'51"	586m	4/2015

G-TK54	Grape	City Center	N/37º37'66"	E/36º54'50"	555m	4/2015
M-TK55	Mix	City Center	N/37º37'66"	E/36º54'50"	555m	4/2015
G-TK56	Grape	City Center	N/37º37'66"	E/36º54'51"	623m	4/2015
M-TK57	Mix	City Center	N/37º36'60"	E/36º53'55"	620m	4/2015
O-TK58	Olive	City Center	N/37º36'60"	E/36º53'55"	619m	4/2015
M-TKK59	Mix	Kandil kahramanmaras	N/37º37'66"	E/36º54'51"	669m	4/2015
G-TKK60	Grape	Kandil kahramanmaras	N/37º35'66"	E/36º54'52"	670m	4/2015
G-TKK61	Grape	Kandil kahramanmaras	N/37º35'60"	E/36º54'51"	669m	4/2015
M-TKK62	Mix	Kandil kahramanmaras	N/37º37'60"	E/36º54'55"	680m	4/2015
G-TKK63	Grape	Kandil kahramanmaras	N/37º37'66"	E/36º54'51"	681m	4/2015
G-TKK64	Grape	Kandil kahramanmaras	N/37º40'57"	E/36º44'55"	683m	4/2015
G-TKK65	Grape	Kandil kahramanmaras	N/37º40'57"	E/36º44'60"	685m	4/2015
M-TKK66	Mix	Kandil kahramanmaras	N/37º40'58"	E/36º44'60"	680m	4/2015
O-TKK67	Olive	Kandil kahramanmaras	N/37º35'57"	E/36º55'26"	572m	4/2015
O-TKK68	Olive	Kandil kahramanmaras	N/37º35'58"	E/36º55'26"	571m	4/2015
O-TKM69	Olive	Mesire alani Kahramanmaras	N/37º35'58"	E/36º55'26"	572m	4/2015
O-TKM70	Olive	Mesire alani Kahramanmaras	N/37º35'57"	E/36º55'27"	573m	4/2015
G-TKM71	Grape	Mesire alani Kahramanmaras	N/37º35'55"	E/36º55'22"	570m	4/2015
O-TKM72	Olive	Mesire alani Kahramanmaras	N/37º35'57"	E/36º55'27"	572m	4/2015
O-TKM73	Olive	Mesire alani Kahramanmaras	N/37º35'57"	E/36º55'23"	570m	4/2015
O-TKM74	Olive	Mesire alani Kahramanmaras	N/37º35'53"	E/36º55'25"	570m	4/2015
M-TKM75	Mix	Mesire alani Kahramanmaras	N/37º35"55"	E/36º55'22"	572m	4/2015
O-TKM76	Olive	Mesire alani Kahramanmaras	N/37º35'75"	E/36º58'45"	569m	4/2015
O-TKM77	Olive	Mesire alani Kahramanmaras	N/37º35'75"	E/36º58'45"	569m	4/2015
O-TKM78	Olive	Mesire alani Kahramanmaras	N/37º35'75"	E/36º58'44"	569m	4/2015
O-TKD79	Olive	derekoy kahramanmaras	N/37º35'77"	E/36º58'44"	566m	4/2015
M-TKD80	Mix	Derekoy Kahramanmaras	N/37º35'77"	E/36º58'43"	566m	4/2015
O-TKD81	Olive	Derekoy Kahramanmaras	N/37º35'17"	E/36º58'38"	570m	4/2015
M-TKD82	Mix	Derekoy Kahramanmaras	N/37º35'25"	E/36º58'38"	569m	4/2015
O-TKD83	Olive	Derekoy Kahramanmaras	N/37º35'25"	E/36º58'39"	569m	4/2015
O-TKD84	Olive	Derekoy Kahramanmaras	N/37º35'20"	E/36º58'40"	568m	4/2015
O-TKD85	Olive	Derekoy Kahramanmaras	N/37º35'20"	E/36º58'41"	568m	4/2015
O-TKD86	Olive	Derekoy Kahramanmaras	N/37º37'55"	E/36º58'13"	569m	4/2015
O-TKD87	Olive	Derekoy Kahramanmaras	N/37º37'55"	E/36º58'13"	569m	4/2015
O-TKD88	Olive	Derekoy Kahramanmaras	N/37º35'65"	E/36º58'15"	571m	4/2015
O-TKD89	Olive	Derekoy Kahramanmaras	N/37º34'65"	E/36º58'16"	571m	4/2015
O-TKD90	Olive	Derekoy Kahramanmaras	N/37º34'66"	E/36º58'16"	571m	4/2015
M-TKD91	Mix	Derekoy Kahramanmaras	N/37º34'66"	E/36º58'16"	571m	4/2015
G-TKD92	Grape	Dogu kent Kahramanmaras	N/37º34'54"	E/36º57'57"	569m	4/2015
G-TKD93	Grape	Dogu kent Kahramanmaras	N/37º34'54"	E/36º57'57"	569m	4/2015
O-TKD94	Olive	Dogu kent Kahramanmaras	N/37º35'13"	E/36º58'53"	588m	4/2015
O-TKD95	Olive	Dogu kent Kahramanmaras	N/37º35'13"	E/36º58'53"	588m	4/2015
M-TKD96	Mix	Dogu kent Kahramanmaras	N/37º35'13"	E/36º58'53"	588m	4/2015
O-TKD97	Olive	Dogu kent Kahramanmaras	N/37º35'11"	E/36º58'55"	585m	4/2015
M-TKD98	Mix	Dogu kent Kahramanmaras	N/37º35'11"	E/36º58'55"	585m	4/2015
O-TKD99	Olive	Dogu kent Kahramanmaras	N/37º35'25"	E/36º58'57"	580m	4/2015
O-TKD100	Olive	Dogu kent Kahramanmaras	N/37º35'43"	E/36º58'58"	577m	4/2015
O-TKD101	Olive	Dogu kent Kahramanmaras	N/37º35'43"	E/36º58'60"	577m	4/2015
M-TKD102	Mix	Dereli Kahramanmaras	N/37º35'43"	E/36º58'58"	577m	4/2015
M-TKD103	Mix	Dereli Kahramanmaras	N/37º35'43"	E/36º58'58"	577m	4/2015
M-TKD104	Mix	Dereli Kahramanmaras	N/37º35'43"	E/36º58'58"	577m	4/2015
M-TKD105	Mix	Dereli Kahramanmaras	N/37º35'43"	E/36º58'57"	579m	4/2015
M-TKD106	Mix	Dereli Kahramanmaras	N/37º35'40"	E/36º58'50"	579m	4/2015
M-TKD107	Mix	Dereli Kahramanmaras	N/37º35'42"	E/36º58'50"	580m	4/2015
M-TKD108	Mix	Dereli Kahramanmaras	N/37º35'43"	E/36º58'53"	580m	4/2015
M-TKD109	Mix	Dereli Kahramanmaras	N/37º35'43"	E/36º58'59"	585m	4/2015
M-TKD110	Mix	Dereli Kahramanmaras	N/37º35'45"	E/36º58'56"	570m	4/2015
O-TKD111	Olive	Dereli Kahramanmaras	N/37º36'63"	E/36º59'24"	569m	4/2015

O-TKK112	Olive	Kilavuzlu	Karhamanmaras	N/37º36'02"	E/36º49'28"	579m	4/2015
M-TKK113	Mix	Kilavuzlu	Karhamanmaras	N/37º36'02"	E/36º49'28"	580m	4/2015
M-TKK114	Mix	Kilavuzlu	Karhamanmaras	N/37º36'02"	E/36º49'30"	585m	4/2015
M-TKK115	Mix	Kilavuzlu	Karhamanmaras	N/37º36'52"	E/36º49'30"	600m	4/2015
M-TKK116	Mix	Kilavuzlu	Karhamanmaras	N/37º36'52"	E/36º49'30"	600m	4/2015
G-TKK117	Grape	Kilavuzlu	Karhamanmaras	N/37º36'55"	E/36º49'29"	598m	4/2015
G-TKK118	Grape	Kilavuzlu	Karhamanmaras	N/37º36'55"	E/36º49'29"	598m	4/2015
M-TKK119	Mix	Kilavuzlu	Karhamanmaras	N/37º36'57"	E/36º49'29"	590m	4/2015
O-TKK120	Olive	Kilavuzlu	Karhamanmaras	N/37º36'58"	E/36º48"20"	580m	4/2015
O-TKK121	Olive	Kilavuzlu	Karhamanmaras	N/37º36'58"	E/36º48'20"	580m	4/2015
M-TKK122	Mix	Kilavuzlu	Karhamanmaras	N/37º36'58"	E/36º48'25"	580m	4/2015
G-TKK123	Grape	Kilavuzlu	Karhamanmaras	N/37º37'20"	E/36º48'25"	525m	4/2015
G-TKK124	Grape	Kilavuzlu	Karhamanmaras	N/37º37'20"	E/36º48'25"	525m	4/2015
O-TKK125	Olive	Kilavuzlu	Karhamanmaras	N/37º37'24"	E/36º48'25"	525m	4/2015

SAMPLES FROM IRAQ

Code	Crop	Locality	Latitude	Longitude	High	Date
O-KDS1	Olive	Sumel Duhok	N/36º85'47"	E/42º88'16"	501m	8/2014
M-KDS2	Mix	Sumel Duhok	N/36º85'47"	E/42º88'16"	497m	8/2014
O-KDS3	Olive	Sumel Duhok	N/36º85'50"	E/42º88'15"	506m	8/2014
O-KDS4	Olive	Sumel Duhok	N/36º85'51"	E/42º87'78"	435m	8/2014
G-KDZ5	Grape	Zawita Duhok	N/36º90'46"	E/43º13'56"	434m	8/2014
M-KDZ6	Mix	Zawita Duhok	N/36º90'40"	E/43º13'41"	878m	8/2014
G-KDZ7	Grape	Zawita Duhok	N/36º90'77"	E/43º13'75"	855m	8/2014
O-KDG8	Olive	Garmava Duhok	N/36º93'04"	E/43º96'54"	621m	8/2014
G-KDG9	Grape	Garmava Duhok	N/36º93'11"	E/42'96'50"	624m	8/2014
G-KDQ10	Grape	Qarqarava Duhok	N/36º92'27"	E/43º11'63"	761m	8/2014
M-KDS11	Mix	Sindore Duhok	N/36º90'85"	E/43º06'19"	784m	8/2014
G-KDS12	Grape	Sindore Duhok	N/36º91'08"	E/43º09'45"	797m	8/2014
G-KDB13	Grape	Bade Duhok	N/36º90'44"	E/43º10'48"	923m	8/2014
G-KDB14	Grape	Bade Duhok	N/36º90'46"	E/43º10'65"	926m	8/2014
G-KDB15	Grape	Bade Duhok	N/36º90'53"	E/43º10'80"	929m	8/2014
G-KDZ16	Grape	Zawita Duhok	N/36º90'89"	E/43º12'42"	961m	8/2014
G-KDZ17	Grape	Zawita Duhok	N/36º91'09"	E/43º11'19"	979m	8/2014
G-KDQ18	Grape	Qasrok Duhok	N/36º90'15"	E/43º02'01"	682m	8/2014
G-KDQ19	Grape	Qasrok Duhok	N/36º90'01"	E/43º01'88"	684m	8/2014
O-KDQ20	Olive	Qasrok Duhok	N/36º89'43"	E/43º01'62"	572m	8/2014
G-KDD21	Grape	Dashtabere Duhok	N/36º95'66"	E/43º11'50"	510m	9/2014
G-KDD22	Grape	Dashtabere Duhok	N/36º95'66"	E/43º11'50"	510m	9/2014
O-KDD23	Olive	Dashtabere Duhok	N/36º90'66"	E/43º11'20'	683m	9/2014
G-KDB24	Grape	Bade Duhok	N/36º95'60"	E/43º12'25"	902m	9/2014
G-KDB25	Grape	Bade Duhok	N/36º85'60"	E/43º15'20"	904m	9/2014
M-KDB26	Mix	Bade Duhok	N/36º82'86"	E/43º16'55"	876m	9/2014
G-KDP27	Grape	Peda Duhok	N/36º85'97"	E/43º19'71"	881m	9/2014
M-KDB28	Mix	Bedul Duhok	N/36º86'41"	E/43º23'70"	609m	9/2014
G-KDB29	Grape	Baneye Duhok	N/36º88'68"	E/43º24'09"	646m	9/2014
G-KDR30	Grape	Rashanke Duhok	N/36º92'39"	E/43º11'17"	932m	9/2014
O-KDD31	Olive	Dlbe Duhok	N/36º83'90"	E/42º90'90"	429m	9/2014
M-KDD31	Mix	Dlbe Duhok	N/36º83'92"	E/42º90'55"	429m	9/2014
M-KDA33	Mix	Aloka Duhok	N/36º84'70"	E/42º91'68"	429m	9/2014
O-KDQ34	Olive	Qasara Duhok	N/36º85'31"	E/42º31'22"	417m	9/2014
O-KDS35	Olive	Slevane Duhok	N/36º72'11"	E/42º33'51"	443m	9/2014
G-KDG36	Grape	Grepane Duhok	N/36º81'05"	E/42º92'16"	448m	9/2014
G-KD37	Grape	city Center	N/36º89'25"	E/42º99'25"	628m	9/2014
G-KDP38	Grape	Peromara Duhok	N/36º89'40"	E/42º99'17"	624m	9/2014
G-KDB39	Grape	Bakhornev Duhok	N/36º93'03"	E/42º97'65"	694m	9/2014
G-KDL40	Grape	Lenava Duhok	N/36º93'42"	E/42º97'56"	658m	9/2014
G-KDB41	Grape	Bade Duhok	N/36º90'63"	E/43º10'03"	939m	12/2014
G-KDB42	Grape	Bade Duhok	N/36º90'39"	E/43º10'03"	943m	12/2014
G-KDB43	Grape	Bade Duhok	N/36º90'65"	E/43º10"02"	950m	12/2014
G-KDB44	Grape	Bade Duhok	N/36º90'66"	E/43º10'04"	930m	12/2014
G-KDB45	Grape	Bade Duhok	N/36º90'68"	E/43º10'04"	935m	12/2014
G-KDB46	Grape	Besere Duhok	N/36º86'29"	E/43º06'65"	677m	12/2014
G-KDB47	Grape	Besere Duhok	N/36º86'27"	E/43º06'77"	684m	12/2014
G-KDB48	Grape	Besere Duhok	N/36º86'28"	E/43º06'88"	671m	12/2014
G-KDB49	Grape	Besere Duhok	N/36º86'39"	E/43º06'82"	710m	12/2014
M-KDB50	Mix	Besere Duhok	N/36º86'23"	E/43º07'00"	670m	12/2014
G-KDB51	Grape	Barbuhar Duhok	N/36º87'52"	E/43º10'66"	758m	12/2014
G-KDB52	Grape	Barbuhar Duhok	N/36º87'56"	E/43º10'49"	746m	12/2014
G-KDB53	Grape	Barbuhar Duhok	N/36º87'62"	E/43º10'33"	751m	12/2014

G-KDB54	Grape	Barbuhar Duhok	N/36º87'66"	E/43º10'16"	760m	12/2014
M-KDB55	Mix	Barbuhar Duhok	N/36º87'67"	E/43º09'90"	734m	12/2014
G-KDB56	Grape	Barbuhar Duhok	N/36º87'67"	E/43º09'69"	735m	12/2014
O-KDZ57	Olive	Zawita Way Duhok	N/36º89'73"	E/43º13'23"	890m	12/2014
O-KDZ58	Olive	Zawita Way Duhok	N/36º89'89"	E/43º13'28"	895m	12/2014
G-KDZ59	Grape	Zawita Way Duhok	N/36º90'03"	E/43º13'30"	907m	12/2014
M-KDG60	Mix	Grka Duhok	N/36º90'61"	E/43º13'38"	917m	12/2014
G-KDG61	Grape	Grka Duhok	N/36º90'60"	E/43º13'19"	920m	12/2014
M-KDG62	Mix	Grka Duhok	N/36º90'71"	E/43º12'97"	930m	12/2014
M-KDG63	Mix	Grka Duhok	N/36º90'76"	E/43º12'77"	950m	12/2014
G-KDG64	Grape	Grka Duhok	N/36º90'91"	E/43º12'43"	967m	12/2014
G-KDB65	Grape	Bablo Duhok	N/36º86'93"	E/43º14'75"	963m	12/2014
G-KDB66	Grape	Bablo Duhok	N/36º86'99"	E/43º14'94"	946m	12/2014
G-KDB67	Grape	Bablo Duhok	N/36º86'99"	E/43º15'38"	940m	12/2014
G-KDB68	Grape	Bablo Duhok	N/36º86'92"	E/43º15'59"	920m	12/2014
O-KDP69	Olive	Peda Duhok	N/36º85'91"	E/43º19'52"	932m	12/2014
G-KDP70	Grape	Peda Duhok	N/36º86'04"	E/43º20'24"	883m	12/2014
G-KDB71	Grape	Bedul Duhok	N/36º86'33"	E/43º23'73"	656m	12/2014
G-KDB72	Grape	Bedul Duhok	N/36º86'55"	E/43º23'99"	608m	12/2014
G-KDB73	Grape	Bedul Duhok	N/36º86'72"	E/43º24'67"	605m	12/2014
G-KDB74	Grape	Bedul Duhok	N/36º86'90"	E/43º24'14"	606m	12/2014
G-KDB75	Grape	Bedul Duhok	N/36º87'99"	E/43º24'11"	670m	12/2014
G-KDB76	Grape	Bedul Duhok	N/36º88'10"	E/43º24'23"	705m	12/2014
G-KDB77	Grape	Bedul Duhok	N/36º88'32"	E/43º24'10"	657m	12/2014
O-KDB78	Olive	Bedul Duhok	N/36º89'10"	E/43º24'41"	744m	12/2014
G-KDB79	Grape	Bedul Duhok	N/36º89'44"	E/43º24'06"	905m	12/2014
G-KDB80	Grape	Bedul Duhok	N/36º90'05"	E/43º23'75"	923m	12/2014
G-KDE81	Grape	Emink Duhok	N/36º86'95"	E/43º09'85"	765m	2/2015
G-KDE82	Grape	Emink Duhok	N/36º86'95"	E/43º09'85"	769m	2/2015
G-KDE83	Grape	Emink Duhok	N/36º86'93"	E/43º09'43"	784m	2/2015
G-KDE84	Grape	Emink Duhok	N/36º86'60"	E/43º09'77"	761m	2/2015
M-KDE85	Mix	Emink Duhok	N/36º86'47"	E/43º09'51"	761m	2/2015
O-KDE86	Olive	Emink Duhok	N/36º86'46"	E/43º09'35"	756m	2/2015
G-KDE87	Grape	Emink Duhok	N/36º86'41"	E/43º09'35"	767m	2/2015
G-KDE88	Grape	Emink Duhok	N/36º86'39"	E/43º09'37"	774m	2/2015
O-KDE89	Olive	Emink Duhok	N/36º89'00"	E/43º09'41"	784m	2/2015
M-KDM90	Mix	Mangeshke Duhok	N/36º92'68"	E/43º14'91"	786m	2/2015
G-KDM91	Grape	Mangeshke Duhok	N/36º92'76"	E/43º14'73"	794m	2/2015
G-KDM92	Grape	Mangeshke Duhok	N/36º92'93"	E/43º14'50"	801m	2/2015
G-KDM93	Grape	Mangeshke Duhok	N/36º93'07"	E/43º14'21"	812m	2/2015
G-KDM94	Grape	Mangeshke Duhok	N/36º93'58"	E/43º14'11"	867m	2/2015
G-KDM95	Grape	Mangeshke Duhok	N/36º93'90"	E/43º12'82"	886m	2/2015
M-KDM96	Mix	Mangeshke Duhok	N/36º93'98"	E/43º12'62"	888m	2/2015
O-KDM97	Olive	Mangeshke Duhok	N/36º94'14"	E/43º12'00"	880m	2/2015
O-KDM98	Olive	Mangeshke Duhok	N/36º94'55"	E/43º11'44"	900m	2/2015
O-KDM99	Olive	Mangeshke Duhok	N/36º94'81"	E/43º11'00"	903m	2/2015
O-KDM100	Olive	Mangeshke Duhok	N/36º94'81"	E/43º10"86"	901m	2/2015
G-KDM101	Grape	Mamane Duhok	N/36º94'55"	E/43º11'49"	900m	2/2015
G-KDM102	Grape	Mamane Duhok	N/36º594'94"	E/43º10'60"	903m	2/2015
G-KDM103	Grape	Mamane Duhok	N/36º95'00"	E/43º10'44"	903m	2/2015
M-KDM104	Mix	Mamane Duhok	N/36º95'04"	E/43º10'25"	903m	2/2015
G-KDM105	Grape	Mamane Duhok	N/36º95'11"	E/43º09'81"	893m	2/2015
G-KDD106	Grape	Dergali Duhok	N/36º95'07"	E/43º09'23"	879m	2/2015
G-KDD107	Grape	Dergali Duhok	N/36º95'16"	E/43º08'82"	883m	2/2015
G-KDD108	Grape	Dergali Duhok	N/36º95'64"	E/43º06'40"	877m	2/2015
G-KDD109	Grape	Dergali Duhok	N/36º96'06"	E/43º07'57"	851m	2/2015
G-KDD110	Grape	Dergali Duhok	N/36º96'23"	E/43º06'60"	838m	2/2015
O-KDP111	Olive	Peromara Duhok	N/36º37'24"	E/42º48'20"	530m	4/2015

O-KDP112	Olive	Peromara Duhok	N/36º37'26"	E/42º48'24"	530m	4/2015
M-KDP113	Mix	Peromara Duhok	N/36º37'20"	E/42º48'45"	514m	4/2015
O-KDP114	Olive	Peromara Duhok	N/36º37'21"	E/42º48'45"	514m	4/2015
O-KDP115	Olive	Peromara Duhok	N/36º37'21"	E/42º48'45"	515m	4/2015
O-KDP116	Olive	Peromara Duhok	N/36º37'20"	E/42º48'44"	514m	4/2015
O-KDZ117	Olive	Zawita Duhok	N/36º53'26"	E/43º73'58"	865m	10/2015
G-KDZ118	Grape	Zawita Duhok	N/36º51'23"	E/43º72'59"	866m	10/2015
G-KDZ119	Grape	Zawita Duhok	N/36º52'26"	E/43º70'40"	860m	10/2015
G-KDZ120	Grape	Zawita Duhok	N/36º55'26"	E/43º60'51"	861m	10/2015
G-KDZ121	Grape	Zawita Duhok	N/36º51'20"	E/43º65'59"	861m	10/2015
G-KDZ122	Grape	Zawita Duhok	N/36º52'30"	E/43º62'60"	861m	10/2015
G-KDZ123	Grape	Zawita Duhok	N/36º53'26"	E/43º73'58"	851m	10/2015
O-KDZ124	Olive	Zawita Duhok	N/36º50'20"	E/43º70'59"	851m	10/2015
O-KDZ125	Olive	Zawita Duhok	N/36º53'25"	E/43º74'50"	864m	10/2015

CURRICULUM VITAE

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Educational Background

Degree	Place of Education	Date of Graduate
Bachelor's Degree	University of Duhok College of Agriculture Plant Protection Department	2011-2012
Master Degree	KSU, Graduate School of Natural and Applied Science, Bioengineering and Sciences	2014-2015

Language Skills

Kurdish, Arabic, English, Turkish