

<http://www.pjbs.org>

PJBS

ISSN 1028-8880

**Pakistan
Journal of Biological Sciences**

ANSI*net*

Asian Network for Scientific Information
308 Lasani Town, Sargodha Road, Faisalabad - Pakistan

Determination of Weed Species and Their Frequency and Density in Olive Groves in Hatay Province of Turkey

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Abstract: Olive is native plant of the Hatay province of Turkey. Fifty-one olive groves surveyed twice during 2003-2004 growing season. Ninety-two weed species were determined, which belong to 29 plant families. One third of species was from two families of class Monocotyledoneae and the others were from class Dicotyledoneae. Most common families were Poaceae, Asteraceae and Fabaceae. *Glycyrrhiza glabra* L., *Sorghum halepense* (L.) Pers. and *Convolvulus arvensis* L. were the most dense species. *G. glabra* L. (81.6%), *S. halepense* (L.) Pers. (81.4%), *Portulaca oleracea* L. (76.1%), *Prosopis farcta* (Banks. and Sol.) Macbride (69.7%) and *C. arvensis* L. (68.8%) were the most common weeds.

Key words: Olive, weed flora, density, frequency

INTRODUCTION

Olive (*Olea europea* L.) is an important crop for Turkey which has 11% of olive trees, 7% of olive groves and 12% of olive produce out of the world^[1]. Olive is one of the prevailing export commodities of Turkey and main income source of farmers living the Aegean and Mediterranean regions of Turkey. Hatay province, where it is located in Eastern Mediterranean part of Turkey and it is believed that olive growing as old as human history and spread out to world from triangle of Hatay, Kahramanmaraş and Mardin provinces of Turkey^[2], has 5% of olive trees and 6% production areas of Turkey^[3]. Although Turkey among the countries in top five in olive areas and olive production, olive yield is highly low^[1]. Weeds and unsuitable weed control practices are considered among the factors, which cause yield loss. It is possible to increase olive yield 200 to 1000 kg ha⁻¹ by implementing fertilization, pruning, pest control and weed control^[4]. Indeed, Uludag *et al.*^[5] stressed that weeds are underestimated in olive production and there has been few study on weeds to improve proper weed management programs in Turkey.

Weeds decrease olive yield and root development^[6,7]. Competition between olive and weeds are more severe in early years of olive growth, which root development is limited. Weeds are harmful on olive not only with their direct effects on yield but also indirect effects on disease development and pests. Weeds increase the possibility of olive knot disease (*Pseudomonas syringia* pv. *savastanoi*) via increasing frost damage by decreasing

soil temperature and of leaf spot disease (*Spilocaea oleagina*) by increasing humidity in olive groves^[8]. Wilt disease (*Verticillium dahlia*) spreads and increases using weeds alternative host^[9-11]. Rodents, which damages young trees uses weedy areas for their nests and dried weeds might cause fires^[8]. In addition, weeds make difficult and expensive olive harvesting^[12].

Erten and Nemli^[13] surveyed some olive sapling nurseries in the Aegean region of Turkey and found 109 weeds species in nurseries. There is no survey to determine weed species and problems in olive groves in Turkey. Whereas to prepare an efficient olive weed management, first of all the problem weeds and general weed flora in olive groves should be known. This study contains results of a weed survey in which was conducted in Hatay province of Turkey.

MATERIALS AND METHODS

The survey was carried out to identify the weed species, their frequencies and densities in olive groves in Hatay province in 2003-2004. Hatay has typical Mediterranean climate, which is hot and dry summers and rainy winters (Fig. 1). Total 51 groves which minimum distance was 3 km between two closest grove, were visited twice in August through September for summer weeds and in April and May for winter weeds. In each surveyed grove, a 1000 m² area was selected which did not have any margin effects. Weed species were recorded and number of weeds was counted in four 1 m² quadrats where are located randomly in the selected area^[14].

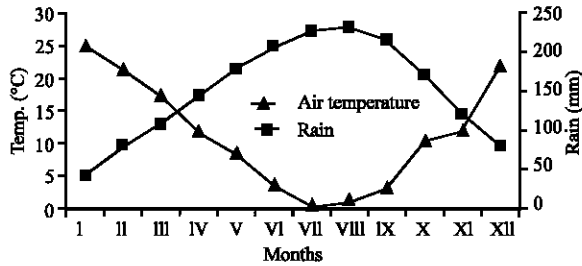


Fig. 1: Fifty-year average climatic conditions for Hatay province^[22]

The density of weeds was calculated as arithmetical means (plants per m²) and classified using A-E scale which is modified from Uludag and Katkat^[15]. In the scale;

- A represents >3 plants m⁻²
- B represents 2-3 plants m⁻²
- C represents 1-2 plants m⁻²
- D represents 0.1-1 plants m⁻²
- E represents <0.1 plants m⁻²

The frequency of occurrence of weeds was calculated using a formula^[14]:

$$F.O. (\%) = n/m \times 100$$

Where, F.O. is frequency of occurrence as percentage, n represents the number of sampled groves where each species occurs and m for the number of total sampled groves.

RESULTS AND DISCUSSION

In olive groves in Hatay, 92 weed species were identified belonging to 29 families in olive orchards (Table 1). One third of species (30 species) belonged to two families of class Monocotyledoneae and 62 weed species was from 27 families of class Dicotyledoneae. However, more than half of the species was from (54.3%) only three families, which are Poaceae, Asteraceae and Fabaceae (Table 1). Those families are the richest families in the number of plant species in flora of Turkey^[16]. Those families were found the most in other agricultural areas too^[17]. Poaceae family involved 19 species (20.7%), followed by Asteraceae family with 18 species (19.6%)

and Fabaceae family with 13 species (14.1%). All the other families were represented by a few species, which ranged between 1 and 3.

The identified weed species were mostly annuals (70.7%) while perennial species constituted 22.8% and biennials 6.5%. However, annual species showed less frequency than perennials except *Portulaca oleracea* L. and *Avena sterilis* L., which were determined more than half of the groves. *Glycyrrhiza glabra* L. (A), *Sorghum halepense* (L.) Pers. (B) and *Convolvulus arvensis* L. (C) showed higher average density than the all other species. *G. glabra* and *S. halepense* were the most common species which were found over 80% of groves as well *Convolvulus arvensis* L. is among the most common species with its occurrence frequency of 68.8%. Seven species which were (*A. sterilis*, *Convolvulus arvensis* L., *C. dactylon*, *G. glabra*, *P. oleracea*, *Prosopis farcta* (Banks. and Sol.) Macbride and *S. halepense*) found more than half of the groves (Table 1). Except *A. sterilis* and *P. oleracea*, the others were perennials. Tillage is the common practice in olive groves for weed control and other agronomic purposes^[5,18]. Frequent tillages, which can be implemented 7 times a year, could cause perennials becoming dominant species^[19,20]. It has been known that tillage eliminates weeds that propagate with seeds and increases weed densities that propagate with under soil parts such as rhizomes via causing disappearance of apical dominance^[19]. The higher incidence of *P. oleracea* and *A. sterilis* might be due to manure applications because seeds can keep their germination ability after even digestion by animals^[21].

Some species such as *Avena* spp., *Geranium dissectum* L., *Solanum nigrum* L. and *Xanthium strumarium* L. are among alternative host species of *Verticillium dahlia* Kleb.^[9,11] although the disease is not common in Hatay. However, heavy tillage can cause scares in olive roots which might lead infestation of disease. Dry summers and lack of irrigation might be a reason for disease is not spreading in Hatay unlike the other olive growing regions of Turkey.

Unfortunately it was difficult to get agricultural practices for each groves because of lack of proper records. However, common and dense weeds such as *S. halepense* are the result of improper agricultural implementations. Harmful effects of weeds and environmental considerations require development of suitable weed management programs.

Table 1: Weed species in olive groves in Hatay, their families, densities and frequency

Weed species	LF	DE	FR	Weed species	LF	DE	FR
Amaranthaceae				Geraniaceae			
<i>Amaranthus albus</i> L.	AN*	D	9.66	<i>Erodium cicutarium</i> (L.) L'Herit.	AN	E	5.75
<i>Amaranthus hybridus</i> L.	AN	D	8.71	<i>Geranium dissectum</i> L.	AN	D	9.31
<i>Amaranthus retroflexus</i> L.	AN	D	23.30	Guttiferae			
Apiaceae				<i>Hypericum</i> sp.	PE	D	26.10
<i>Daucus carota</i> L.	BI**	D	7.26	Lamiaceae			
Asteraceae				<i>Lamium amplexicaule</i> L.	AN	D	4.88
<i>Anthemis arvensis</i> L.	AN	D	15.00	<i>Mentha arvensis</i> L.	PE	E	3.94
<i>Calendula arvensis</i> L.	AN	E	1.52	Malvaceae			
<i>Carduus pycnocephalus</i> L.	BI	D	13.00	<i>Hibiscus trionum</i> L.	AN	D	8.78
<i>Centaurea iberica</i> Trev. Ex Sprengel	AN	D	28.90	<i>Malva neglecta</i> Wallr.	AN	D	10.00
<i>Chondrilla juncea</i> L.	PE***	D	7.26	Papaveraceae			
<i>Chrysanthemum</i> sp.	AN	E	1.85	<i>Fumaria officinalis</i> L.	AN	D	19.30
<i>Cichorium intybus</i> L.	PE	D	4.88	<i>Papaver rhoeas</i> L.	AN	D	18.80
<i>Conyza bonariensis</i> (L.) Cronquist	AN	E	1.52	Plantaginaceae			
<i>Conyza canadensis</i> (L.) Cronquist	AN	D	10.60	<i>Plantago lanceolata</i> L.	PE	E	3.94
<i>Imula viscosa</i> (L.) Aiton	PE	D	22.70	<i>Plantago major</i> L.	PE	E	2.38
<i>Lactuca serriola</i> L.	BI	D	12.10	Poaceae			
<i>Senecio vernalis</i> Waldst. and Kit.	AN	D	12.00	<i>Alopecurus myosuroides</i> Hudson	AN	D	12.90
<i>Senecio vulgaris</i> L.	AN	E	3.03	<i>Avena fatua</i> L.	AN	E	8.47
<i>Silybum marianum</i> (L.) Gaertner	AN	E	5.41	<i>Avena sterilis</i> L.	AN	D	50.50
<i>Sonchus arvensis</i> L.	PE	D	4.46	<i>Bromus</i> sp.	AN	D	4.88
<i>Sonchus oleraceus</i> L.	BI	D	4.88	<i>Cynodon dactylon</i> (L.) Pers.	PE	D	68.20
<i>Xanthium spinosum</i> L.	AN	E	2.08	<i>Digitaria sanguinalis</i> (L.) Scop.	AN	D	6.40
<i>Xanthium strumarium</i> L.	AN	D	23.30	<i>Echinochloa colonum</i> (L.) Link	AN	D	38.00
Boraginaceae				<i>Eleusine indica</i> (L.) Gaertner	AN	D	14.20
<i>Anchusa azurea</i> Miller	PE	E	3.03	<i>Eragrostis cilianensis</i> (All.) Vign. -Lut.	AN	E	7.83
<i>Heliotropium europaeum</i> L.	AN	D	10.90	<i>Hordeum murinum</i> L.	AN	D	14.00
Brassicaceae				<i>Lolium temulentum</i> L.	AN	D	17.90
<i>Capsella bursa pastoris</i> (L.) Medik.	AN	D	22.60	<i>Panicum miliaceum</i> L.	AN	E	1.52
<i>Hirschfeldia incana</i> (L.) Lag.-Foss.	BI	D	11.10	<i>Paspalum paspalodes</i> (Michx.) Scribner	PE	E	3.90
<i>Raphanus raphanistrum</i> L.	AN	D	8.59	<i>Phalaris brachystachys</i> Link	AN	D	8.92
<i>Sinapis alba</i> L.	AN	E	2.08	<i>Phalaris minor</i> Retz.	AN	D	15.00
<i>Sinapis arvensis</i> L.	AN	D	42.60	<i>Poa annua</i> L.	AN	E	1.85
Capparaceae				<i>Setaria verticillata</i> (L.) P.Beauv	AN	E	1.52
<i>Capparis spinosa</i> L.	PE	E	3.03	<i>Setaria viridis</i> (L.) P.Beauv	AN	D	6.85
Caryophyllaceae				<i>Sorghum halepense</i> (L.) Pers.	PE	B	81.40
<i>Cerastium dichotomum</i> L.	AN	D	5.11	Polygonaceae			
<i>Silene</i> sp.	AN	D	4.88	<i>Polygonum aviculare</i> L.	AN	D	10.80
<i>Stellaria media</i> (L.) Vill.	AN	D	3.90	<i>Rumex acetosa</i> L.	PE	E	8.59
Chenopodiaceae				Portulacaceae			
<i>Chenopodium album</i> L.	AN	D	30.80	<i>Portulaca oleracea</i> L.	AN	D	76.10
Convolvulaceae				Primulaceae			
<i>Convolvulus arvensis</i> L.	PE	C	68.80	<i>Anagallis arvensis</i> L.	AN	D	5.98
Cyperaceae				Rosaceae			
<i>Cyperus rotundus</i> L.	PE	D	23.10	<i>Rubus idaeus</i> L.	PE	E	7.26
Euphorbiaceae				Rubiaceae			
<i>Chrozophora tinctoria</i> (L.) Rafin.	AN	D	3.90	<i>Galium aparine</i> L.	AN	D	6.73
Fabaceae				Scrophyllaceae			
<i>Athagi pseudalhagi</i> (Bieb.) Desv.	PE	E	3.90	<i>Kickxia spuria</i> (L.) Dumort.	AN	E	1.52
<i>Glycyrrhiza glabra</i> L.	PE	A	81.60	Solanaceae			
<i>Lathyrus</i> sp.	AN	D	7.49	<i>Physalis angulata</i> L.	AN	E	4.55
<i>Medicago orbicularis</i> (L.) Bart.	AN	D	7.26	<i>Solanum nigrum</i> L.	AN	D	9.76
<i>Medicago</i> sp.	AN	D	1.52	Tiliaceae			
<i>Melilotus officinalis</i> (L.) Desr.	BI	D	1.52	<i>Corchorus olitorius</i> L.	AN	E	2.08
<i>Melilotus</i> sp.	AN	E	3.94	Urticaceae			
<i>Ochtodium aegyptiacum</i> (L.) DC.	AN	D	8.78	<i>Urtica urens</i> L.	AN	D	24.90
<i>Prosopis farcta</i> (Banks. and Sol.) Mac.	PE	D	69.70	Zygophyllaceae			
<i>Trifolium pratense</i> L.	PE	D	4.88	<i>Tribulus terrestris</i> L.	AN	D	6.97
<i>Trifolium</i> sp.	AN	E	2.38				
<i>Vicia cracca</i> L.	AN	E	1.85				
<i>Vicia sativa</i> L.	AN	D	4.17				

*AN: Annual, **BI: Biennial, ***PE: Perennial, LF: Life form, DE: Density, FR: (%) Frequency

ACKNOWLEDGMENT

Author thank to Dr. Ahmet ULUDAG because of his proof reading of manuscript.

REFERENCES

1. FAO, 2003. FAO Statistical Database. (www.fao.org.)
2. Mendilcioglu, K., 1990. Subtropik Iklim Meyve Turleri (Zeytin). E.U.Z.F. Ders Teksiri, Bornova-Izmir.
3. Anonymous, 2003. Hatay Tarim Müdürlüğü Kayitlari.
4. Civantos, L., 1988. Current status and trends in techniques. Options Mediterraneennes, pp: 35-40.
5. Uludag, A., I. Uremis and L. Erten, 2003. Are weeds problem in olive grows. Symposium on Olive and Olive Oil, pp: 94-101.
6. Muhammad, Da'u and A.R. Al-Saghir, 1986. Weed control in olive orchards. Dirasat, 13: 141-147.
7. Bini, G. and S. Ghisolfi, 1986. No-tillage of the soil using herbicides: a prospect for olive growing. Informatore Agroria, 42: 77-81.
8. Elmore, C.L., D.W. Cudney and D.R. Donaldson, 2002. UC IPM Pest Management Guidelines: Olive, Weeds. UC ANR Publication 3452.
9. Thanassouloupoulos, C.C., D.A. Biridis and E.C. Tjamos, 1981. Weed hosts as inoculum source of *Verticillium* in olive orchards. Phytopathologia Mediterranea, 20: 164-168.
10. Mesturno, L., 1990. Possible Hosts of *Verticillium dahliae* Kleb. among weeds infesting a Tuscan Olive grove. Rivista di Patologia Vegetale, 26: 59-67.
11. Ligoxigakis, E.K. and D.J. Vakalounakis, 1994. The incidence and distribution of races of *Verticillium dahlie* in Crete. Plant Pathology, 43: 755-758.
12. Pollastro, L., 1977. Circles under olive trees to facilitate harvesting. Lotto Antiparassitaria, 29: 170-171.
13. Erten, L. and Y. Nemli, 1997. Zeytin fidanliklarında gorulen yabanciotlar ve yogunluklarinin belirlenmesi uzerinde calismalar. Turkiye II. Herboloji Kongresi, pp: 133-140.
14. Odum, E.P., 1971. Fundamentals of Ecology. W.B. Saunders Company, Philadelphia, London, Toronto, pp: 574.
15. Uludag, A. and M. Katkat, 1993. Guneydogu Anadolu Bolgesi'nde meyve fidanliklarında bulunan yabanci otlar ve yogunluklarinin belirlenmesi uzerinde calismalar. Turkiye I. Herboloji Kongresi, pp: 175-184.
16. Davis, P.H., 1965-1988. Flora of Turkey and East Aegean Islands. Vol. 1-9, Edinburgh University Press, Edinburgh.
17. Ulug, E., I. Kadioglu and I. Uremis, 1993. Weeds of Turkey and Their Some Characteristics. Tarim ve Köyisleri Bakanligi Zirai Mucadele Arastirma Enstitusu Yay. No: 78, Adana, pp: 513.
18. Ayanoglu, H., C. Toplu and S. Bayazit, 2000. Hatay ili zeytinciliginin teknik yapisi. Turkiye I. Zeytincilik Sempozyumu, pp: 64-69.
19. Uygur, F.N., 1985. Untersuchungen zu Art und Bedeutung der Verunkrautung in der Cukurova unter Besonderer Berücksichtigung von *Cynodon dactylon* (L.) Pers und *Sorghum halepense* (L.) Pers. PLITS, 1985/3 (5), Josef Margraf, Stuttgart-Germany, pp: 109.
20. Uygur, F.N., A. Duzenli, H. Cakan, E. Orel, N. Turkmen, O. Boz and S. Uygur, 1995. Plant species required to be protected in Goksu Delta, Silifke-Turkiye. VIth Plant Life in Southwest and Central Asia Symposium, pp: 660-672.
21. Ozer, Z., 1982. Koyun sindirim organlari ve gubre ihtimarinin bazi yabanciot tohumlarinin cimlenme kabiliyet ve guclerine etkileri uzerinde arastirmalar. A.U. Yayinlari No: 597. Zir Fak. Yay. No: 278. Erzurum. (in Turkish).
22. Anonymous, 1999. Hatay Meteoroloji Mudurlugu Kayitlari.