

Agrestal and Ruderal Weeds of some Crops in Abha, Saudi Arabia

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Abstract

In the present study agrestal and ruderal weeds flora associated within growing fields of; Cabbage, Fennel, Peppermint, Lettuce and Onion in Abha governorate, Saudi Arabia was reported. A total of 66 angiospermic species belonging to 28 families were found as ruderal weeds. Maximum numbers of species (17) were belonged to the family Poaceae followed by Asteraceae (9) and Solanaceae (5) *Commicarpus grandiflorus* and *Rumex usambarensis* were found to be the most frequently occurring and densely populated weeds with absolute frequency (AF) of 100% and absolute density (AD) of 5.69 and 8.14 respectively. The other frequently occurring and densely populated weeds were *Argemone ochroleuca*, *Chenopodium murale*, *Convolvulus arvensis*, *Lycium shawii*, *Ochradenus baccatus*, *Solanum incanum* and *Sonchus oleraceus* with (AF) ranging from 53–73% and (AD) from 0.83–6.10. Less frequently occurring weeds with (AF) between 26–48% include fourteen species. The least frequently occurring species with (AF) 24% or below and (AD) from 0.02–0.17 include forty three species. The results in the present study show dominance of the ruderal over the agrestal weeds which may be due to ploughing and cleaning of agricultural soil.

Key words: Agrestal, ruderal, weeds.

Introduction

Agriculture plays a crucial role in the economy of Saudi Arabia, so that weed surveys are useful for determining the occurrence and importance of weed species in crop production systems (Frick and Thomas, 1992). Documenting the kinds of weed species and its relative distribution facilitates the establishment of priorities for research and extension services (Mc Closky *et al.*, 1998). Saudi Arabia is a large country with an arid climate in most parts of the regions. However, due to the topographic differences and variations in soil compositions, a significant number of species and plant associations can be seen in many places. The plant diversity of Saudi Arabia is relatively not simple, as one would expect for a desert' country. Rather, it is a complex flora having affinities with the floras of East Africa, North Africa, the Mediterranean countries and the Irano-Turanian countries. The variation in climate and topography in the Asir region has led to the formation of diverse plant community (Abulfatih, 1984). Places of foggy cold

climate dominated by *Juniperus procera*. Acacia trees are widely distributed to the east and west of Asir highland region. Communities of *Ficus salicifolium* and *Ziziphus spina-christi* var. *spina-christi* are common in the lowlands. Many other communities are found on the steep slopes to the west and south of the highlands. Communities of hydrophytes are found in lakes, ponds, and streams (Abulfatih, 1984). Meanwhile plant life in Saudi Arabia has raised the attention of numerous scholars; (Abulfatih 1991, 1992; Alfarhan 1999; Alfarhan 2000; Alfarhan *et al.*, 1997; Al-Hemaid 1996; Al-Turki *et al.*, 2000, 2001; Baierle *et al.*, 1985; Boulos 1985, 1994; Collenette 1985; Ghafoor and Al-Turki 1999; Fayed *et al.*, 1987; Fayed and Zayed, 1989). and many others. The aim of this study was to record weeds plants growing as agrestal and rudreal during growing season of some cultivated crops in Abha governorate, Saudi Arabia.

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Materials and methods

Site Description

Abha governorate, Saudi Arabia is located in the south west of Saudi Arabia on the highland of Asir governorate. It is about of 90 km east of the Red Sea and about 220 km north of Yemen. It is situated in a hilly area, which drops gradually to the east. The landscape is featured by rolling lands, rocky hills, wadis, and permanently wet sites represented by the man made as Abha Lake. Soils in these habitats are sandy mixed with small sized rocks. It has climatic variation in temperature, rainfall and cloud formation coupled with the complex of topography. The area is under the influence of the prevailing south westerly winds during most of the year. These winds primarily originate in Africa and along the Arabian Sea and then pass over the Red Sea before reaching the Asir highlands. Mean annual rainfall recorded at Abha 332 m, and the mean maximum temperature is about 22.4 °C and the minimum about 10 °C according the meteorological data from Abha governorate station.

Field Surveys

Field surveys of different crops growing areas in Abha governorate were conducted during the growing season of 2009-2010. Seven sites were selected to study weed distribution. Sampling was randomly done using 1×1 m² quadrat. According to Riaz *et al.*, (2007), the data regarding prevalence, absolute, relative frequency, absolute and relative density of weeds were calculated by applying the following formulas; percentage of Prevalence = (number of sites in which a specie occurs/Total number of sites) x 100, percentage of Absolute Frequency = (number of quadrates in which a specie occurs/Total number of quadrates) x 100, percentage of Relative Frequency = (Absolute frequency value of a species/Total absolute frequency for all species) x 100, percentage of Absolute density = total number of individual of a species in all quadrates/Total number of quadrates and percentage of Relative density = (Absolute density value of a species/Total absolute density for all species) x 100.

Results and discussion

Weeds management in cultivated lands involve the use of many techniques and strategies, all with the goal of achieving weed control and maximal crop yields. Ideally, growers would like to achieve a level of zero weeds on their farms. In practice, this may not be achievable, but any reduction in weeds and in the amount of weed seed or perennial propagules reaching the soil will make subsequent weed control. For weeds to grow, they must have access of water, nutrients, and light (Bowman, 1997). Vise-versa, there are many reasons exert a control on weed growth inside the cultivated crops. Crops, which can grow vigorously, can often outcompete weeds. Crops that are well adapted to their planted areas are often better competitors for weeds since they will tend to occupy a site rapidly. In addition, a close-planted crop will close the canopy more rapidly, reducing the weeds' ability to compete. Some crops (including tomato, bean, and sweet corn) competed effectively with weeds, while others (including onion and garlic) never established a competitive canopy (Bowman, 1997).

In the present study, 66 weeds species belonging to (28) angiospermic families were found as a rudreal weeds in cultivated crops including; cabbage, fennel, peppermint, lettuce and onion. Maximum number of species (17) belongs to the family Poaceae followed by Asteraceae (9) and Solanaceae (5) were recorded.

As shown in (Table 1), *Commicarpus grandiflorus*, *Lycium shawii*, and *Rumex usambarensis* were found to be the most frequently occurring weed with relative frequency (RF) from 4.49–6.11%, and they recorded in all seven studied fields showing 100% prevalence and absolute frequency (AF) of 73–100%. Six species namely *Argemone ochroleuca*, *Convolvulus arvensis*, *Datura stramonium* var. *stramonium*, *Ochradenus baccatus*, *Solanum incanum* and *Sonchus oleraceus* showed 71% prevalence with absolute frequency (AF) from 42–63% and relative frequency (RF) from 2.62–3.87%. Other six species namely *Acacia etbaica*, *Aristida adscensionis*, *Chenopodium murale*, *Dichanthium annulatum*, *Reseda lutea* and *Schinus molle* exhibited 57% prevalence

with absolute frequency (AF) from 20–55% and relative frequency (RF) from 1.24–3.37%. Fifty one species showed a low prevalence from 14–42% which are; *Acacia pachyceras* var. *najdensis*, *Ageratum conyzoides*, *Aerva javanica*, *Aizoon canariense*, *Aloe vacillans*, *Amaranthus viridis*, *Arundo donax*, *Asparagus africanus*, *Asphodelus fistulosus*, *Avena fatua*, *Beta vulgaris*, *Brassica tournefortii*, *Calotropis procera*, *Chenopodium album*, *Crepis kotschyana*, *Cynodon dactylon*, *Diplachne fusca*, *Dodonaea viscosa* var. *viscosa*, *Echinops spinosus*, *Echium plantagineurn*, *Eragrostis cilianensis*, *Eragrostis minor*, *Eruca sativa*, *Eucalyptus globules*,

Euphorbia prostrate, *Ficus palmata*, *Forsskaolea tenacissima*, *Pulicaria undulata*, *Launaea arborescens*, *Cardaria chalepensis*, *Leptadenia pyrotechnica*, *Phragmanthera regularis*, *Malva parviflora*, *Panicum coloratum*, *Pennisetum setaceum*, *Pennisetum villosum*, *Phalaris minor*, *Phoenix dactylifera*, *Poa annua*, *Polypogon monspeliensis*, *Reichardia picroides*, *Reichardia tingitana*, *Rumex dentatus*, *Setaria pumila*, *Setaria verticilliformis*, *Sisymbrium irio*, *Solanum nigrum*, *Tetrapogon villosum*, *Withania somnifera*, *Xanthium strumarium* and *Ziziphus spina-christi* var. *spina-christi*.

Species	Family	P (%)	AF (%)	RF (%)	AD	RD (%)
<i>Aizoon canariense</i> L.	Aizoaceae	14	10	0.62	0.10	0.16
<i>Aerva javanica</i> (Burm. f.) Juss. ex Schult.	Amaranthaceae	42	14	0.87	0.26	0.42
<i>Amaranthus viridis</i> L.	"	42	30	1.87	2.65	4.25
<i>Calotropis procera</i> (Aiton) W.T.Aiton	Apocynaceae	42	30	1.87	0.61	0.98
<i>Schinus molle</i> L.	Anacardiaceae	57	20	1.24	0.40	0.65
<i>Leptadenia pyrotechnica</i> (Forssk.) Decne.	Asclepiadaceae	14	10	0.62	0.14	0.22
<i>Asparagus africanus</i> Lam.	Asparagaceae	14	10	0.62	0.10	0.16
<i>Ageratum conyzoides</i> L.	Asteraceae	42	36	2.24	1.12	1.80
<i>Crepis kotschyana</i> Boiss.	"	14	6.0	0.37	0.34	0.55
<i>Echinops spinosus</i> L.	"	42	30	1.87	0.40	0.65
<i>Pulicaria undulata</i> (L.) C.A. Meyer.	"	14	4.0	0.24	0.10	0.16
<i>Launaea arborescens</i> (Batt.) Murb	"	42	24	1.49	0.42	0.68
<i>Reichardia picroides</i> (L.) Roth	"	28.	18	1.12	0.26	0.42
<i>Reichardia tingitana</i> (L.) Roth	"	28	14	0.87	0.34	0.55
<i>Sonchus oleraceus</i> L.	"	71	61	3.74	3.06	4.90
<i>Xanthium strumarium</i> L.	"	14	2.0	0.12	0.02	0.03
<i>Phoenix dactylifera</i> L.	Arecaceae	28	6.0	0.37	0.06	0.09
<i>Echium plantagineurn</i> L.	Boraginaceae	42	36	2.24	0.40	0.65
<i>Brassica tournefortii</i> Gouan	Brassicaceae	42	24	1.49	0.55	0.88
<i>Eruca sativa</i> Mill. subsp. <i>lativalvis</i> (Boiss.) Greuter & Burdet	"	28	6.0	0.37	0.38	0.62
<i>Cardaria chalepensis</i> (L.) Hand.-Maz.	"	14	2.0	0.12	0.10	0.16
<i>Sisymbrium irio</i> L.	"	28	28	1.74	6.12	9.81
<i>Beta vulgaris</i> L.	Chenopodiaceae	28	10	0.62	0.14	0.22
<i>Chenopodium album</i> L.	"	28	14	0.87	0.63	1.01
<i>Chenopodium murale</i> L.	"	57	55	3.37	2.14	3.43
<i>Convolvulus arvensis</i> L.	Convolvulaceae	71	63	3.87	6.10	9.78
<i>Euphorbia prostrata</i> Aiton	Euphorbiaceae	28	16	0.99	0.20	0.32
<i>Acacia etbaica</i> Schweinf. subsp. <i>etbaica</i> Schweinf.	Fabaceae	57	34	2.12	0.38	0.62
<i>Acacia pachyceras</i> Sw. var. <i>najdensis</i> (Chaudhary) Boulos	"	28	20	1.24	0.22	0.36
<i>Phragmanthera regularis</i> (Steud. ex Sprague) M.G.Gilbert	Loranthaceae	28	12	0.74	0.26	0.42
<i>Malva parviflora</i> L.	Malvaceae	28	6.0	0.37	0.18	0.29
<i>Ficus palmata</i> Forssk.	Moraceae	42	14	0.87	0.18	0.29
<i>Eucalyptus globulus</i> Labill	Myrtaceae	28	12	0.74	0.14	0.22
<i>Argemone ochroleuca</i> Sweet	Papaveraceae	71	55	3.37	2.67	4.28
<i>Aristida adscensionis</i> L.	Poaceae	57	48	2.99	1.57	2.52

<i>Arundo donax</i> L.	“	42	12	0.74	0.42	0.68
<i>Avena fatua</i> L.	“	28	22	1.37	0.30	0.49
<i>Cynodon dactylon</i> (L.) Pers.	“	42	30	1.87	0.38	0.62
<i>Dichanthium annulatum</i> (Forssk.) Stapf	“	57	40	2.49	1.02	1.63
<i>Diplachne fusca</i> (L.) Kunth	“	14	10	0.62	0.14	0.22
<i>Eragrostis cilianensis</i> (All.) Vignolo ex Janch.	“	28	8.0	0.49	0.14	0.22
<i>Eragrostis minor</i> Host	“	14	2.0	0.12	0.04	0.06
<i>Panicum coloratum</i> L.	“	14	2.0	0.12	0.06	0.09
<i>Pennisetum setaceum</i> (Forsk.) Chiov.	“	42	26	1.62	0.46	0.75
<i>Pennisetum villosum</i> R.Br. ex Fresen	“	42	18	1.12	0.34	0.55
<i>Phalaris minor</i> Retz.	“	14	6.0	0.37	0.34	0.55
<i>Poa annua</i> L.	“	42	18	1.12	0.67	1.08
<i>Polypogon monspeliensis</i> (L.) Desf.	“	42	14	0.87	0.28	0.45
<i>Setaria pumila</i> (Poir.) Roem. & Schult.	“	42	10	0.62	0.26	0.42
<i>Setaria verticilliformis</i> Dunart.	“	42	18	1.12	0.22	0.36
<i>Tetrapogon villosus</i> Desf.	“	42	14	0.87	0.26	0.42
<i>Rumex dentatus</i> L.	Polygonaceae	28	18	1.12	0.20	0.32
<i>Rumex usambarensis</i> (Dammer) Dammer	“	100	100	6.11	8.14	13.0
<i>Aloe vacillans</i> Forssk.	Liliaceae	14	2.0	0.12	0.02	0.03
<i>Asphodelus fistulosus</i> L.	“	14	2.0	0.12	0.02	0.03
<i>Commicarpus grandiflorus</i> (A.Rich.) Standl	Nyctaginaceae	100	100	6.11	5.69	9.13
<i>Ziziphus spina-christi</i> var. <i>spina-christi</i> (L.) Desf.	Rhamnaceae	28	14	0.87	0.14	0.22
<i>Ochradenus baccatus</i> Delile	Resedaceae	71	61	3.74	1.83	2.94
<i>Reseda lutea</i> L.	“	57	46	2.87	0.85	1.37
<i>Dodonaea viscosa</i> var. <i>viscosa</i> Jacq.	Sapindaceae	28	6.0	0.37	0.14	0.22
<i>Datura stramonium</i> var. <i>stramonium</i> L.	Solanaceae	71	42	2.62	0.55	0.88
<i>Solanum incanum</i> L.	“	71	53	3.24	0.83	1.34
<i>Solanum nigrum</i> L.	“	28	6.0	0.37	0.18	0.29
<i>Lycium shawii</i> Roem. & Schult	“	100	73	4	4.06	6.51
<i>Withania somnifera</i> (L.) Dunal.	“	28	14	0.87	0.18	0.29
<i>Forsskaolea tenacissima</i> L.	Urticaceae	42	16	0.99	0.63	1.01

Table 1. Prevalence, Absolute frequency, Relative frequency; Absolute density, Relative density of weeds in growing fields of Cabbage, Fennel, Peppermint, Lettuce and Onion in Abha Governorate

The previous recorded weeds which recorded as a ruderal may be in the future will become the aggressive weeds in the cultivated crops due to their high reproductive potential, fast growth rate, allelopathic nature causing inhibiting of the root length, shoot length, and weight of cultivated crops (Dagar *et al.*, 1976; Hussain *et al.*, 1992; Navie *et al.*, 1996; Singh *et al.*, 2005; Batish *et al.*, 2007). Also, it is reported that water extracts by various weeds caused inhibition in the length of plumule and radicle, as well as reduction in dry weight and total seedling weight in wheat, pea and lentil (Agarwal *et al.* 2002; Stavrianakou *et al.* 2004; and Dongre and Yadav, 2005). Also weeds reduced forage production by up to 90% (Nath, 1981). In India and Pakistan, *Rumex dentatus* L. is also of major concern in various crops of economic importance including wheat, since

it is a highly competitive weed and can cause drastic yield reduction (Chhokar *et al.* 2007; Anjum and Bajwa 2007; Mehmood *et al.*, 2007). Parasitic species like, *Phragmanthera* sp., which recorded in investigated area, it grows strongly on ageing trees particularly somewhere in the middle of old branches. Once established, it quickly steals the nutrients and sunlight by covering the encroached place such that the branch of the host tree is rendered weak and inactive. So that infestation weeds distribution within crops fields in studying area will give more information about quality and yield losses in crop production systems. Further studies may also be done to check allelopathic effects of various weed species recorded on agricultural crops. P = Prevalence; AF = Absolute frequency; RF = Relative frequency; AD = Absolute density; RD = Relative density.

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الملخص العربي

النباتات البرية التي تنمو داخل وحول بعض الحقول في أبها-المملكة العربية السعودية

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قسم النبات، كلية العلوم، جامعة جنوب الوادي- مصر- قسم علوم الحياة، كلية العلوم، جامعة الملك خالد، المملكة العربية السعودية.

الملخص:

في الدراسة الحالية تم تسجيل النباتات البرية التي تنمو داخل وحول الحقول المنزرعة بالمحاصيل الأتية: الكرنب، الشمر، النعناع، الخس، البصل، أثناء فصل النمو في محافظة أبها بالمملكة العربية السعودية. لم يتم تسجيل أي نباتات برية تنمو داخل الحقول قيد الدراسة بينما تم تسجيل (6٦) نوع من النباتات الزهرية تتبع (٢٨) عائلته تنمو علي حدود تلك الحقول. وقد وجد أكبر عدد من الأنواع النباتية تابع للعائلة النجيلية (١٧) نوع والعائلة المركبة (٩) أنواع والعائلة الباذنجانية (٥) أنواع. *Commicarpus grandiflorus*، *Rumex usambarensis* أكثر الأنواع النباتية تكرارا وكثافة، فقد سجلا تكرارا مطلقا ١٠٠% وكثافة مطلقه ٥,٦٩ و ٨,١٤ علي التوالي. أما الأنواع النباتية المتمثلة في *Argemone*، *Ochradenus*، *Lycium shawii*، *Convolvulus arvensis*، *Chenopodium murale*، *ochroleuca*، *Sonchus oleraceus*، *Solanum incanum*، *baccatus* قد سجلوا كثافة عالية وتكرار مطلقا يتراوح بين ٥٣-٧٣% وكثافة مطلقه بين ٠,٨٣-٦,١٠. أربع عشر نوع نباتي سجلوا كثافة اقل وتكرار مطلقا بين ٢٦-٤٨%. ثلاثة وأربعون نوع نباتي كانوا اقل الأنواع النباتية تكرارا وكثافة حيث سجلوا تكرار مطلقا ٢٤% أو اقل وكثافة مطلقه بين ٠,٠٢-٠,٦٧. هذه الدراسة بينت سيادة النباتات البرية التي علي حدود الحقول المنزرعة عن داخلها وهذا قد يكون ناتج عن حرث الأرض وإزالة النباتات البرية من الأراضي الزراعية.