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Taxonomic Studies of Weed Communities Growing in Date Palm and Christ's Thorn Jujube Farms in Ad-Dawadimi, KSA

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Abstract

The problem of food shortage is one of the most important problems facing many countries in the world. Various factors affect the decline in crop productivity. Where weeds are the most important reasons that cause a huge loss in crop productivity. Studying agricultural ecosystems, knowing their components and explaining the relationship between all of their components, helps a lot in achieving the highest productivity of different crops in addition to benefiting from some types of weeds, as well as, identifying appropriate methods to control the growth of weeds. In this study, 60 species were listed. The most frequent plant families were Asteraceae, Poaceae and Zygophyllaceae. Annuals were the most common life span, as well as, therophytes were the most frequent life form. The most frequent floristic categories were Saharo-Sindian-Sudano-Zambezian and Saharo-Sindian regions. The most famous indicators of biodiversity (species richness, species evenness and species diversity) have been calculated. For managing and classifying data PC-ORD program (TWINSPAN and DCA analyses) was used.

Keywords

Weeds, Palm, Christ's Thorn Jujube, Ad-Dawadimi, Saudi Arabia

1. Introduction

In light of the problem of food shortages facing the world, a special attention to agricultural systems to increase crop productivity was very important. One of the main reasons for the lack of crop productivity is the presence of weeds. Crop productivity losses due to the presence of weeds are greater than those from pests [1]. The presence of weeds in some agricultural systems can lead to a de-

crease in crop productivity to more than 55% [2]. Lots of weeds have allopathic activity [3]. The harmful effects of weeds on crops vary starting from preventing the growth of some crop seeds [4], as well as, competition with crops for natural resources as nutrients, water in the soil and light [5] [6].

Weeds are considered a biological important component in the most ecosystems as range, arable land and forests [7]. One of the reasons for the emergence of weeds in ecosystems is high temperatures in addition to the regular rains. The best time to get rid of weeds is the first stages and they are removed selectively [8]. Soil characteristics and crop type are the most important factors determining the presence and composition of weeds communities [9]. Some weeds are a source of food and secondary pesticides [10], as well as, several weeds have many economic and medical benefits [11]-[21].

Weed control methods include mechanical weeding, hand weeding, burning, slashing, biological control and herbicide use. The choice of a weed control method depends on many factors such as effectiveness, availability, cost, and risks associated with use [22]. Hand hoeing weed is the most effective and safe method of weed control [23]. Modern techniques such as remote sensing programs can be used to control and monitor the growth of weeds for precision management of weeds and to make maps for the distribution of weeds to reduce the excessive use of herbicide that results in severe environmental damage [24].

Date palm (*Phoenix dactylifera*) is a plant species that belongs to family Arecaceae. Palm is one of the most important economic tropical plants, which is a rich source of food and raw materials [25]. Palm is one of the important plant species that was used in traditional medicine for a long time, especially in the Arab countries, as well as many raw materials extracted from palms were used in the production of medicines in modern medicine [26]. Saudi Arabia has approximately 25 million palm trees and is the third globally in the production of dates [27].

Christ's thorn jujube (*Ziziphus spina-christi*) species of plant belongs to family Rhamnaceae. It has been used in traditional medicine, especially in Arab lands for a long time. It has many medical and economic benefits as ant nociceptive activity [28], source for saponins, free sugar, proteins and antidiarrheal effects [29] [30], protective effect against aflatoxicosis [31], treatment pain [32], rich source of flavonoids [33] [34], source for lipids, triterpenoids, alkaloids, free radical scavenging potential and antioxidant activity [35] [36] [37], the hypolipidemic and antioxidant activity [38], antimicrobial activity [39] [40] [41] [42], anti-inflammatory [43] and antibacterial activity [44] [45], Anticancer activity [46] [47] [48] [49], Antidiabetic Potentiality [50], Antiviral activity [51].

Several studies have investigated weed composition in different agroecosystems in Saudi Arabia; in the Eastern part [52], in the Gizan Region [53], in Al-Kharj Region [54], in Al-Qassim Region [55] and in Al-Jouf Region [56] [57]. Nevertheless, [58] indicated that the study of agroecosystems and the evaluation of weeds therein have not received much attention in Saudi Arabia. During the last two decades, weeds formed a major problem in agroecosystems in many

countries of the world, especially in Saudi Arabia. On the Saudi Arabia Northern region studied some species of *Plantago* and Genus *Tephrosia* [59] [60].

Studying agroecosystems, knowing all their components, and understanding the relationship between crops and weeds, and the effect of each on the other, is very important for achieving higher crop yields, as well as, benefiting from some types of weeds. So the aim of this study was to evaluate the weeds that are found in palm and Christ's thorn jujube crops in the Ad-Dawadimi, Saudi Arabia.

2. Materials and Methods

In Ad-Dawadimi, Saudi Arabia 20 stands (ten palm farms and ten Christ's thorn jujube farms) were selected to do evaluate their environmental status. This study has been conducted from February to March 2022.

Five quadrates have been selected, in each stand, the area of each 100 m^2. In every stand, necessary field data were recorded (name and cover of species). Also, soil samples have been collected to do various analyses later on.

Weed species were determined in the field. Then, plant species identification and nomenclature was assured later [61]-[69]. Life forms of the recorded species were identified according to [70] [71], while, chorology were identified according to Eig (1931) [72] and Davis during the period from 1965 to 1985 [73].

In the 20 studied stands 15 soil factors were gauged; moisture content (%). pH, sodium (mg/L), potassium (mg/L), phosphorus (mg/L), bicarbonates (%), chlorides (mg/L), calcium (mg/L), magnesium (mg/L), nitrogen (%), electrical conductivity (EC; mS/cm) and total dissolved salts (ppm) in soil extract, on the other side, carbonates (%), organic carbon (%) and organic matter (%) were gauged, in dried soil. All soil factors were measured after Estefan *et al*., (2013) [74]. Descriptive statistics (average, minimum and maximum) of all soil factors were extracted from Sigma plot 12.5 program.

Biological diversity indicators (species richness, species diversity and species evenness), Two Way Indicator Species Analysis (TWINSPAN) and DE trended Correspondence Analysis (DCA) were extracted from PC-ORD program (McCune and Mefford, 1999) [75].

3. Study Area

Ad-Dawadimi is famous Governorate in Northwest of Riyadh Region, Saudi Arabia. It is characterized by a wonderful location on Najd hill with a total area of 27,500 km^2. It lies at longitudes of 44.3405603˚W and latitude of 24.5091759˚N, nearly 940 m above sea level. Ad-Dawadimi bounded by Unayzah, Al Mithnab, Al Bukayriyah Governorates and Buraydah Town (Al-Qassim Region) to the north, Al Quwaiiyah Governorate (Riyadh Region) to the south, Shaqra Governorate (Riyadh Region) to the east and Afif and Ar Rass Governorates (Al-Qassim Region) to the west. The study area map was extracted from Arc GIS program (**Figure 1**). The mean maximum temperature ranged from 21˚C in January to 41˚C in July and August. On the other hand, the mean minimum temperature

ranged from 5˚C in January to 23˚C in August. Regarding precipitation, no rainfall was recorded in four months of the year; September, August, July and June. On the contrary, April was the rainiest month in this time (Figure 2) was used to illuminate climatic date during 30 years. South wind direction was the most apparent direction in this period followed by the north direction (Figure 3).

4. Results

A collection of 60 species, belonging to 20 families, were listed in farms of both Christ's thorn jujube and palm in Ad-Dawadimi Governorate, Saudi Arabia. The

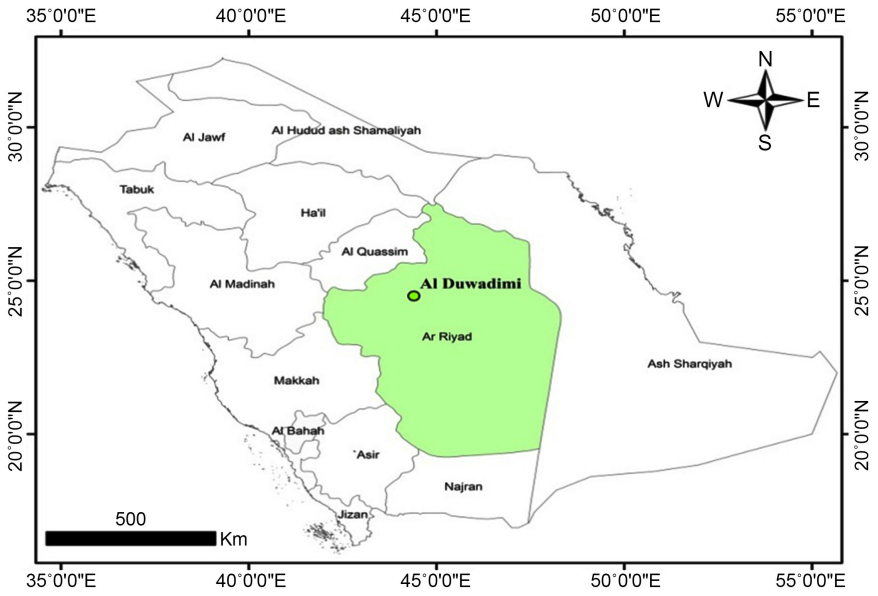

Figure 1. A map of study area; Ad-Dawadimi Governorate, Saudi Arabia.

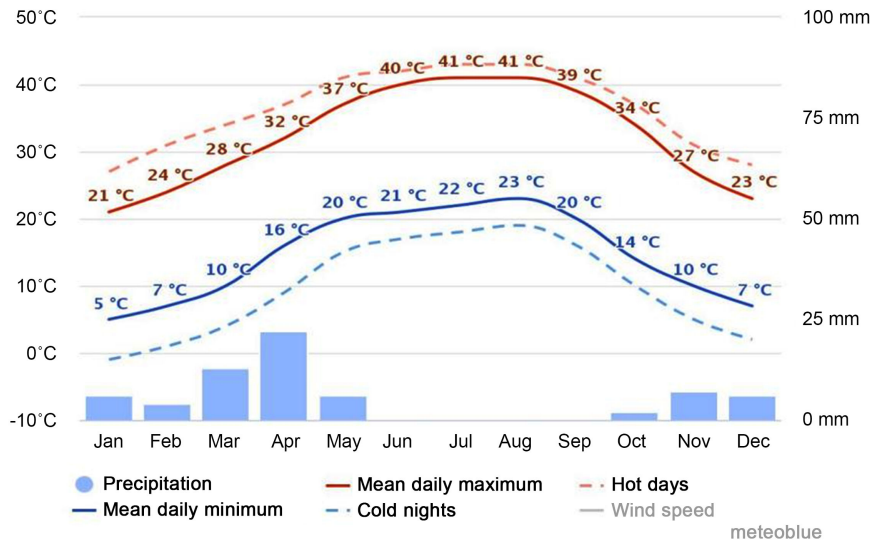

Figure 2. An average of minimum, maximum temperatures and precipitation 30 years ago in Ad-Dawadimi Governorate, Saudi Arabia. https://www.meteoblue.com/.

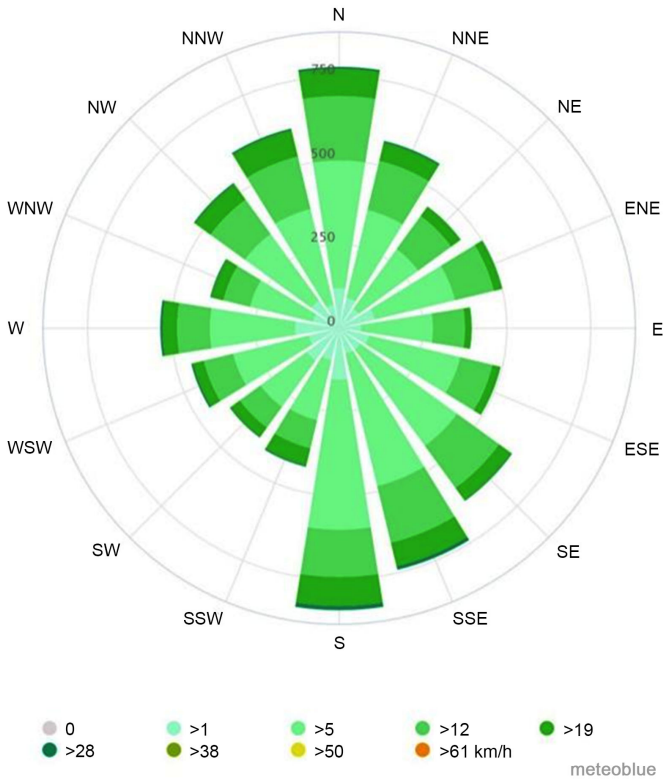

Figure 3. A wind rose of Ad-Dawadimi Governorate, Saudi Arabia.

most frequent families are Asteraceae, Poaceae and Zygophyllaceae with ten species (16.7%), nine species (15%) and seven species (11.7%), respectively. Whereas, Brassicaceae and Fabaceae include four species (6.7%) each. there are three species (5%) in the following families; Chenopodiaceae, Convolvulaceae, Euphorbiaceae and Plantaginacae. While, Borginaceae, Caryophyllaceae and Primulacae have two species (3.3%) each. At last, eight families (Asclepiadaceae, Cyperaceae, Juncaceae, Malvaceae, Polygonaceae, Portulacaceae, Solanaceae and Tamaricaceae) are denoted by a single species (**Table 1** and **Figure 4**).

Concerning recorded species life span, the biggest number of species are annuals with 58.3% (35 species). On the other hand, perennials species have the percent of 41.7% (25 species) (**Table 1** & **Table 2** and **Figure 5**).

With respect to life form, therophyte is the most public life form with 51.7% (31 species), hemicryptophyte was denoted by 18.3% (11 species), chamaephyte was denoted by 15% (9 species). Both of geophyte and phanerophyte were denoted by 6.7% (4 species) each. Parasite was denoted by a single species (*Cuscuta campestris*) (**Table 1** & **Table 3** and **Figure 6**).

As for phytogeographical side, the recorded species belonged to biregional, pluriregional, palaeotropical, monoregional, cosmopolitan and pantropical. First, biregional were 21 species (35%). Second, pluriregional were 12 species (20%). Third, palaeotropical were nine species (15%). Fourth, both monoregional and cosmopolitan were seven species (11.7%) each. Finally, pantropical species were four species (6.7%) (**Table 1** & **Table 4** and **Figure 7**).

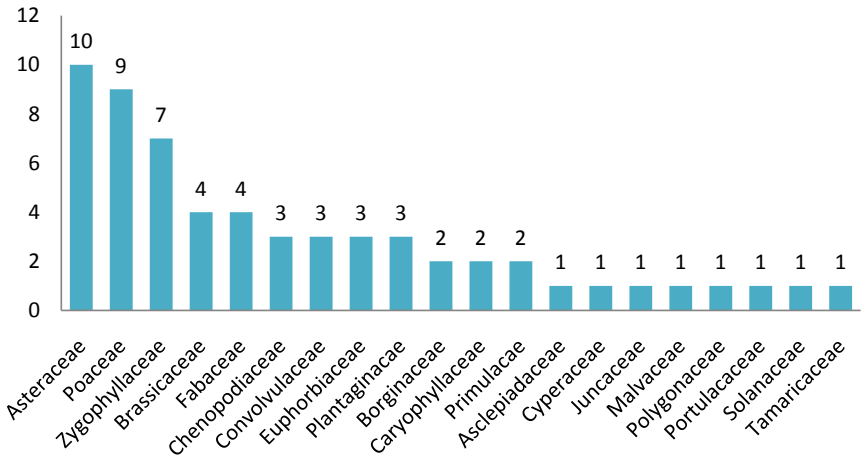

Figure 4. Plant families and the number of plant species in each family.

Table 1. List of species and their families, life spans, life forms and floristic categories in Ad-Dawadimi Governorate.

Family	Species	Life span	Life form	Floristic categories
Asclepiadaceae	*Cynanchum acutum* L.	Per.	Ph.	ME + IR − TR
Asteraceae	*Cichorium endivia* L.	Ann.	Th.	ME + IR − TR
	Conyza bonariensis (L.) Cronquist	Ann.	Th.	ME
	Lactuca serriola L.	Ann.	Th	ME + IR − TR
	Launaea nudicaulis (L.) Hook. f.	Per.	Hem.	IT − TR
	Launea capitata (Spreng.) Dandy	Ann.	Th	SA − SI
	Pulicaria undulata (L.) C.A.Mey.	Per.	Cha.	SA − SI + S − Z
	Senecio glaucus L.	Ann.	Th	IR − TR + SA − SI
	Reichardia tingitana (L.) Roth	Ann	Th	ME + IR − TR
	Pluchea dioscoridis (L.) DC.	Per.	Ph.	SA − SI + S − Z
	Sonchus oleraceus L.	Ann.	Th.	COSM
Borginaceae	*Heliotropium aegyptiacum* Lehm.	Ann.	Th	SA − SI + S − Z
	Heliotropium bacciferum Forssk.	Per.	Cha.	SA − SI + S − Z
Brassicaceae	*Sisymbrium irio* L.	Ann.	Th.	ME + IR − TR
	Eruca sativa Mill.	Ann.	Th.	ME + IR − TR + ER − SR + SA − SI
	Diplotaxis harra Forsk.	Per.	Hem.	IR − TR + SA − SI
	Zilla spinose L.	Per.	Cha.	ME + IR − TR + EU − SI + SA − SI
Caryophyllaceae	*Spergularia marina* (L.) Griseb.	Ann.	Hem.	ME + IR − TR + ER − SR
	Stellaria pallida (Dumort.) Murb.	Ann.	Th.	ME + ER − SR
Chenopodiaceae	*Chenopodium album* L.	Ann.	Th.	COSM
	Chenopodium murale L.	Ann.	Th.	COSM
	Suaeda aegyptiaca (Hasselq.) Zohary.	Ann.	Hem.	SA − SI + S − Z

Continued

Convolvulaceae	*Convolvulus arvensis* L.	Per.	Geo.	PAL
	Cressa cretica L.	Per.	Hem.	PAL
	Cuscuta campestris Yunck.	Ann.	Par.	PAN
Cyperaceae	*Cyperus rotundus* L.	Per.	Geo.	PAN
Euphorbiaceae	*Euphorbia peplus* L.	Ann.	Th.	COSM
	Euphorbia helioscopia L.	Ann.	Th.	COSM
	Ricinus communis L.	Per.	Ph.	PAL
Fabaceae	*Alhagi graecorum* Boiss.	Per.	Hem.	PAL
	Melilotus indicus (L.) All.	Ann.	Th.	PAL
	Prosopis farcta (Banks & Sol.) Macbr.	Per.	Cha.	IR − TR + SA − SI
	Vicia sativa L.	Ann.	Th.	ME
Juncaceae	*Juncus rigidus* Desf.	Per.	Hem.	ME + IR − TR + SA − SI
Malvaceae	*Malva parviflora* L.	Ann.	Th.	ME + IR − TR
Plantaginacae	*Plantago amplexicaulis* Cav.	Ann.	Th	IR − TR + SA − SI
	Plantago lanceolata L.	Ann.	Th	ME + IR − TR + SA − SI
	Plantago ovata Forssk.	Ann.	Th	IR − TR + SA − SI
Poaceae	*Avena fatua* L.	Ann.	Th.	COSM
	Cynodon dactylon (L.) Pers.	Per.	Geo.	PAN
	Imperata cylindrica (L.) Raeusch.	Per.	Hem.	ME + S − Z
	Lolium perenne L.	Per.	Hem.	ME + IR − TR + ER − SR
	Phragmites australis (Cav.) Trin. ex Steud.	Per.	Geo.	PAL
	Polypogon monspeliensis (L.) Desf.	Ann.	Th.	COSM
	Setaria viridis (L.) P. Beauv.	Ann.	Th.	ME + IR − TR + SA − SI
	Poa annua L.	Ann.	Th.	ME + IR − TR + ER − SR
	Dactyloctenium aegyptium (L.) Willd.	Ann.	Th.	PAL
Polygonaceae	*Emex spinosa* (L.) Campd.	Ann.	Th	PAN
Portulacaceae	*Portulaca oleracea* L.	Ann.	Th.	PAL
Primulacae	*Anagallis arvensis* L.	Ann.	Th.	ME + IR − TR + ER − SR
	Samolus valerandi L.	Per.	Hem.	PAL
Solanaceae	*Solanum nigrum* L.	Ann.	Hem.	ME + IR − TR + ER − SR
Tamaricaceae	*Tamarix nilotica* (Ehrenb.) Bunge	Per.	Ph.	SA − SI + S − Z
Zygophyllaceae	*Fagonia arabica* L.	Per.	Cha.	SA − SI
	Fagonia indica Burm. f.	Per.	Cha.	SA − SI
	Fagonia mollis Delile.	Per.	Cha.	SA − SI
	Tribulus terrestris L.	Ann.	Th	IR − TR + ER − SR + SZ
	Zygophyllum album L.f.	Per.	Cha.	ME + IR − TR + SA − SI + S − Z
	Zygophyllum coccineum L.	Per.	Cha.	SA − SI + S − Z
	Zygophyllum simplex L.	Ann.	Th.	SA − SI + S − Z

Table 2. Number of species and percentage belonging to its life span in Ad-Dawadimi Governorate.

Life span	No. of species	Percentage
Annual	35	58.3
Perennial	25	41.7
Total	60	100

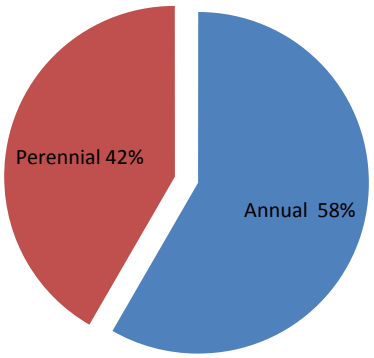

Figure 5. Life span and the percentage of plant species in each.

Table 3. Number of species and percentage according to its life forms in Ad-Dawadimi Governorate.

Life form	No. of species	Percentage
Therophyte	31	51.7
Hemicryptophyte	11	18.3
Chamaephyte	9	15.0
Geophyte	4	6.7
Phanerophyte	4	6.7
Parasite	1	1.7
Total	60	100

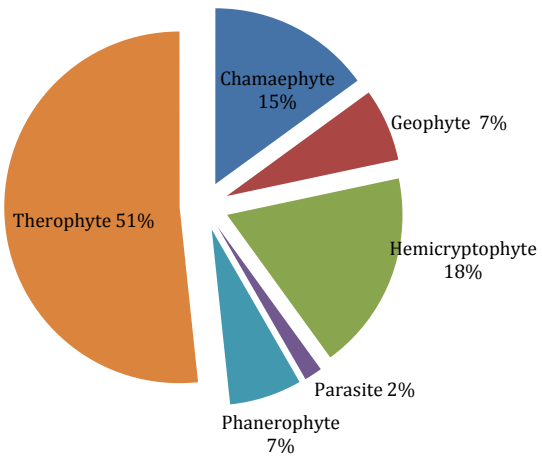

Figure 6. Life forms and percentage of plant species in each.

Table 4. Number of species and percentage belonging to main floristic categories in Ad-Dawadimi Governorate.

Main floristic categories	No. of species	Percentage
Biregionals	21	35.0
Pleuriregionals	12	20.0
Palaeotropical	9	15.0
Monoregional	7	11.7
Cosmopolitan	7	11.7
Pantropical	4	6.7
Total	60	100

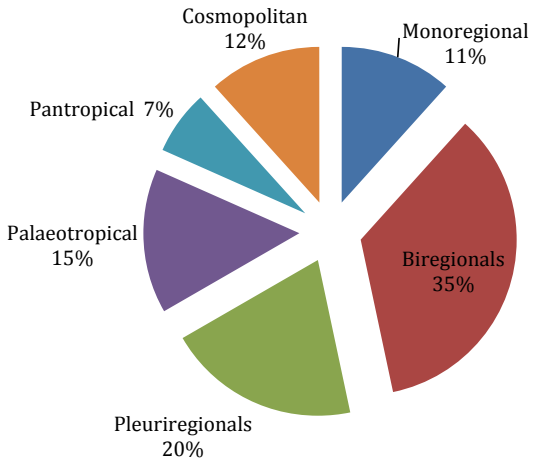

Figure 7. Main floristic categories and percentage of species.

Regarding monoregional, it includes three regions; Saharo-Sindian (4 species = 6.7%), Mediterranean (2 species = 3.3%) and Irano-Turanian (1 species = 1.7%). Biregional contains five regions; Saharo-Sindian-Sudano-Zambesian (8 species = 13.3%), Mediterranean-Irano-Turanian (6 species = 10%), Irano-Turanian-Saharo-Sindian (5 species = 8.3%). Both Mediterranean-Sudano-Zambesian and Mediterranean-Euro-Siberian (1 species = 1.7) each. Pleuriregional includes 6 regions; Mediterranean-Irano-Turanian-Euro-Siberian (5 species = 8.3%), Mediterranean-Irano-Turanian-Saharo-Sindian (3 species = 5%), Mediterranean-Irano-Turanian-Euro-Siberian-Saharo-Sindian (2 species = 3.3%). both of Irano-Turanian-Euro-Siberian-Sudano-Zambesian and Mediterranean-Irano-Turanian-Saharo-Sindian-Sudano-Zambesian (1 species = 1.7%) (Table 1 & Table 5 and Figure 8).

The most important indicators of biological diversity were calculated; species richness; species diversity (Shannon's and Simpson's diversity index) and species evenness. The species richness average was 4.8 species. Shannon's diversity index average was 0.7. Simpson's diversity index average was 0.3. Species evenness average was 0.4.

Table 5. Number of species and percentage belonging to chorology in Ad-Dawadimi Governorate.

Floristic categories	No. of species	Percentage
Monoregional		
IT – TR	1	1.7
ME	2	3.3
SA – SI	4	6.7
Sub total	7	11.7
Biregionals		
SA – SI + S – Z	8	13.3
ME + S – Z	1	1.7
ME + ER – SR	1	1.7
ME + IR – TR	6	10.0
IR – TR + SA – SI	5	8.3
Sub total	21	35.0
Pleuriregionals		
IR – TR + ER – SR + SZ	1	1.7
ME + IR – TR + ER – SR	5	8.3
ME + IR – TR + ER – SR + SA – SI	2	3.3
ME + IR – TR + SA – SI	3	5.0
ME + IR – TR + SA – SI + S – Z	1	1.7
Sub total	12	20.0
World wide		
PAL	9	15.0
PAN	4	6.7
COSM	7	11.7
Sub total	20	33.3
Total	60	100

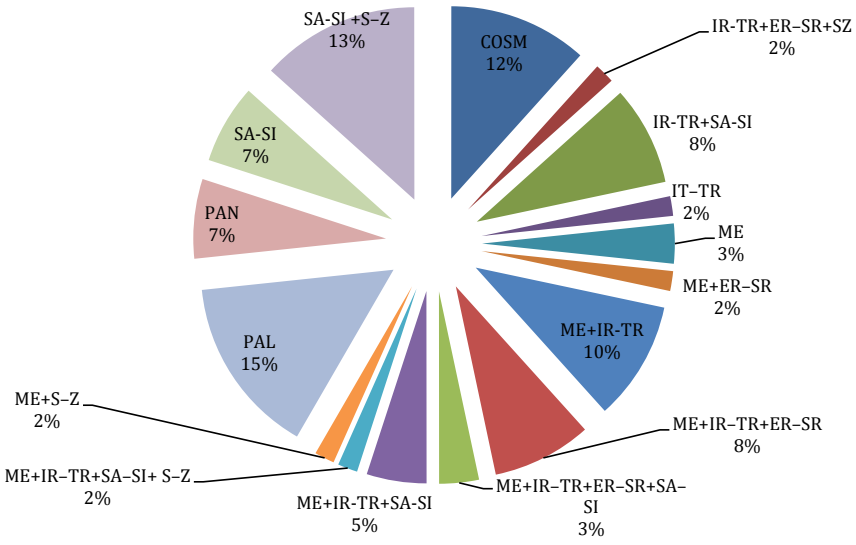

Figure 8. Percentage of species belonging to floristic categories.

Moisture content range was from 2.8% (stand 13) to 31% (stand 18) with an average of 15.3%. pH ranged from 8.1 (stands 14 and 17) to 9.1 (stands 2) with an average of 8.6. Sodium content range was from 342 mg/L (stands 9) to 5542.6 mg/L (stands 14) with an average of 1915.4 mg/L. Potassium content had an average of 139.2 mg/L and ranged from 61.4 mg/L (stands 3) to 412.9 mg/L (stands 14). Phosphorus content range was from 39.4 mg/L (stands 6) to 58.4 mg/L (stands 19) with an average of 47.4 mg/L. Carbonate content range was from 0.3% (stands 20) to 1.1% (stands 15) and with an average of 0.6%. Bicarbonate content range was from 0.3% (stands 4) to 0.9% (stands 18) and with an average of 0.5%. Chlorides content average was 7.1 mg/L and its range was from 1.1 mg/L (stands 13) to 86.7 mg/L (stands 14). Calcium content range was from 60 mg/L (stands 5) to 566.7 mg/L (stands 11) and with an average of 231.7 mg/L. Magnesium content reached the average of 116 mg/L and the range was from 12 mg/L (stands 4) to 600 mg/L (stands 14). Organic matter ranged from 1.5% (stands 14) to 8.1% (stands 13) with an average of 5.4%. Organic carbon had an average of 3.1% and a range from 0.9% (stands 14) to 4.7% (stand 13). Nitrogen content range was from 0.1% (stands 11) to 10.4% (stands 3) with an average of 3.8%. Electrical conductivity recorded an average of 1.9 mS/cm and its range was from 0.2 mS/cm (stand 13) to 9.5 mS/cm (stand 14). Total dissolved salts had an average of 1212.2 ppm and its range was from 130 ppm (stand 13) to 6050 ppm (stand 14) (Table 6).

Table 6. Soil parameters with an average, maximum and minimum value.

Soil parameters	Average (Maximum-Minimum)
Moisture content (%)	15.3 (2.8 - 31)
pH	8.6 (8.1 - 9.1)
Sodium (mg/L)	1915.4 (342 - 5542.6)
Potassium (mg/L)	139.2 (61.4 - 412.9)
Phosphorus (mg/L)	47.4 (39.4 - 58.4)
Carbonate (%)	0.6 (0.3 - 1.1)
Bicarbonate (%)	0.5 (0.3 - 0.9)
Chlorides (mg/L)	7.1 (1.1 - 86.7)
Calcium (mg/L)	231.7 (60 - 566.7)
Magnesium (mg/L)	116 (12 - 600)
Organic matter (%)	5.4 (1.5 - 8.1)
Organic carbon (%)	3.1 (0.9 - 4.7)
Nitrogen (%)	3.8 (0.1 - 10.4)
Electrical conductivity (mS/cm)	1.9 (0.2 - 9.5)
Total dissolved salts (ppm)	1212.2 (130 - 6050)

TWINSPAN analysis showed that 20 stands were divided into two main groups at the first classified level. The first main group is the negative group which comprises ten stands (Sidr farms) and the most famous indicator species for this group is *Ziziphus spina-christi*. At the second division level, the negative group is divided into two groups; the first one comprises three stands (3, 4 and 7) with *Chenopodium album* as an indicator species, while the second one comprises seven stands (1, 2, 5, 6, 8, 9 and 10) with *Cynanchum acutum* and *Spergularia marina* as the indicator species. On the other side, the second main group is the positive group which comprises ten stands (Palm farms) and the most known indicator species for this group is *Phoenix dactylifera*. At the second classified level, the positive group is divided into two groups; the first one comprises six stands (12, 13, 16, 17, 18 and 19) with *Eruca sativa* and *Alhagi graecorum* as the indicator species, while the second one comprises only four stands (11, 14, 15 and 19) with *Juncus rigidus* as an indicator species (**Figure 9**).

DCA analysis illustrated that the 20 stands were classified into two main groups. The first one is Christ's thorn jujube farms stands (1:10) with 13 indicator species (*Anagallis arvensis*, *Suaeda aegyptiaca*, *Spergularia marina*, *Chenopodium album*, *Chenopodium murale*, *Convolvulus arvensis*, *Sonchus oleraceus*, *Polypogon monspeliensis*, *Stellaria pallida*, *Euphorbia peplus*, *Lolium perenne*, *Setaria viridis* and *Cynodon dactylon*). The second one is Palm farms stands (11:20) with 11 indicator species (*Juncus rigidus*, *Tamarix nilotica*, *Phragmites australis*, *Cyperus rotundus*, *Samolus valerandi*, *Imperata cylindrica*, *Cynanchum acutum*, *Eruca sativa*, *Alhagi graecorum*, *Cuscuta campestris* and *Sisymbrium irio*) (**Figure 10**).

DCA analysis illustrated that the 20 stands were classified into two main groups. The first one is Christ's thorn jujube farms stands (1:10) with the most positively correlated soil factors; pH and nitrogen content. The second one is Palm farms stands (11:20) with the positively correlated soil factors; moisture

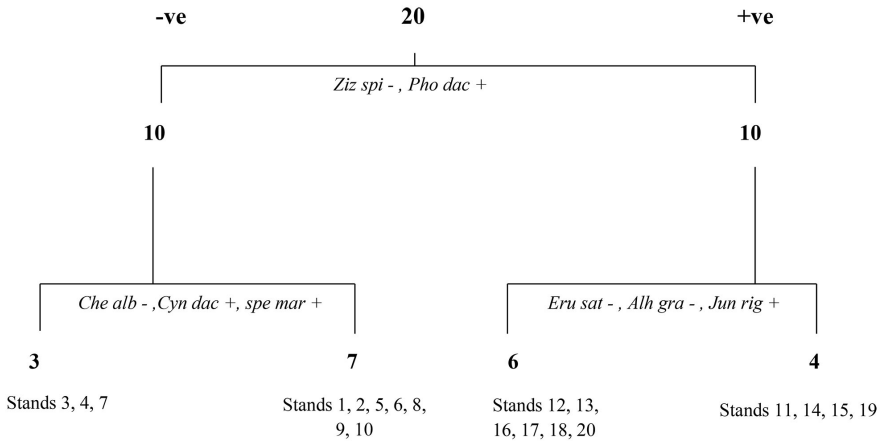

Figure 9. TWINSPAN analysis 20 studied stands in Al Duwadimi. Ziz spi = *Ziziphus spina-christi*, Pho dac = *Phoenix dactylifera*, Che alb = *Chenopodium album*, Cyn dac = *Cynodon dactylon*, Spe mar = *Spergularia marina*, Eru sat = *Eruca sativa*, Alh gra = *Alhagi graecorum* and Jun rig = *Juncus rigidus*.

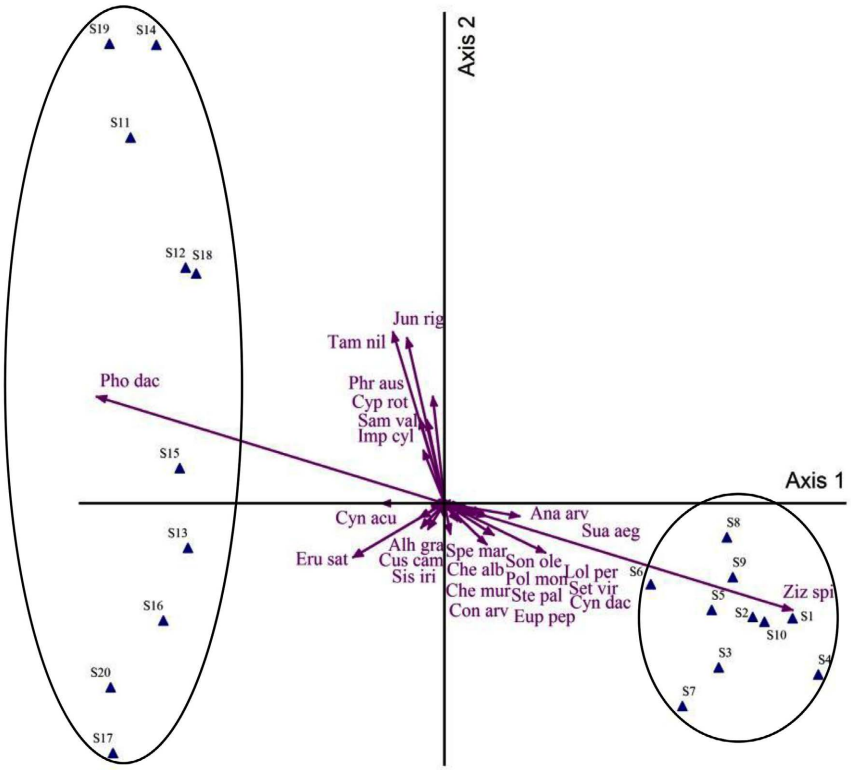

Figure 10. DCA analysis showed the classification of studied stands depending on the indicator species. Ziz spi = *Ziziphus spina-christi*, Pho dac = *Phoenix dactylifera*, Ana arv = *Anagallis arvensis*, Sua aeg = *Suaeda aegyptiaca*, Spe mar = *Spergularia marina*, Che alb = *Chenopodium album*, Che mur = *Chenopodium murale*, Con arv = *Convolvulus arvensis*, Son ole = *Sonchus oleraceus*, Pol mon = *Polypogon monspeliensis*, Ste pal = *Stellaria pallida*, Eup pep = *Euphorbia peplus*, Lol per = *Lolium perenne*, Set vir = *Setaria viridis*, Cyn dac = *Cynodon dactylon*, Jun rig = *Juncus rigidus*, Tam nil = *Tamarix nilotica*, Phr aus = *Phragmites australis*, Cyp rot = *Cyperus rotundus*, Sam val = *Samolus valerandi*, Imp cyl = *Imperata cylindrica*, Cyn acu = *Cynanchum acutum*, Eru sat = *Eruca sativa*, Alh gra = *Alhagi graecorum*, Cus cam = *Cuscuta campestris* and Sis iro = *Sisymbrium irio*.

content, electrical conductivity, total dissolved salts, bicarbonates, chlorides, phosphorus, sodium, potassium, calcium, magnesium, carbonates, organic carbon and organic matter (Figure 11).

5. Discussion

The composition of weed communities was evaluated in two types of crops (Palm and Christ's thorn jujube Farms). Sixty weed species were recorded in farms of Palm and Christ's thorn jujube in Ad-Dawadimi Governorate, Saudi Arabia. The recorded species (60) belonged to 20 plant families. The number of plant species monitored in this study differs relatively from many previous studies conducted on other crops and on other regions in Saudi Arabia. 118 species were recorded in palm plantations in Al-Hasa Region [52], in neglected farms, 51 species were recorded in Al-Kharj Region [54], in palm farms, 55 species were recorded in central part of KSA [55] [76], in plantations of palms and olives, 71

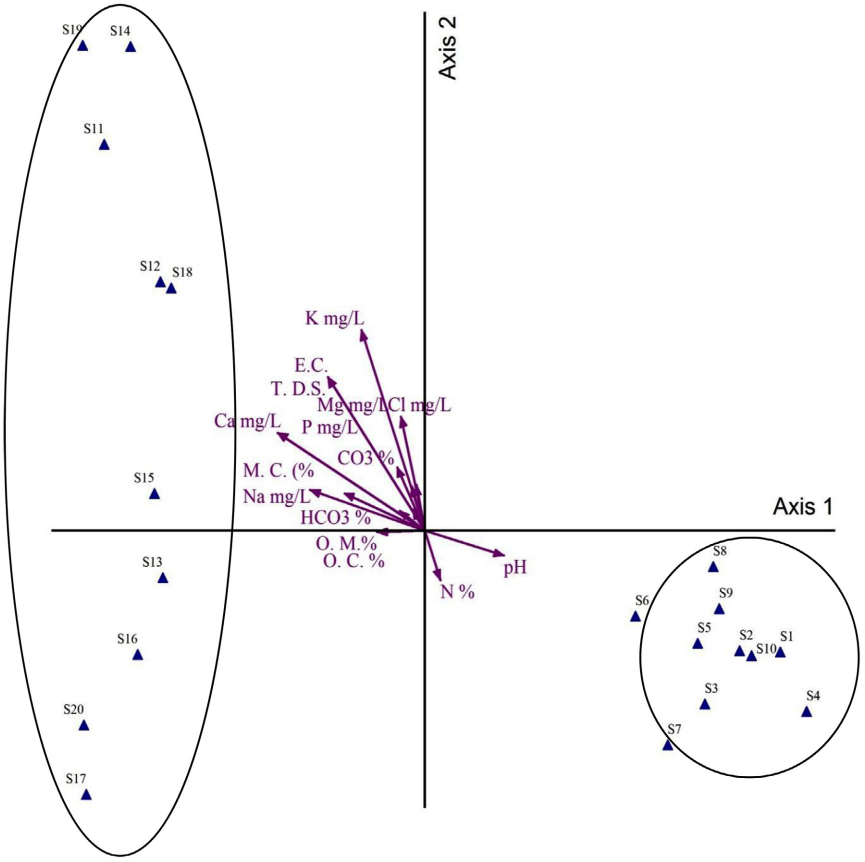

Figure 11. DCA Biplot showing stands classification according to soil factors.

species were recorded in Al-Jouf Region [56], in the olive orchards, 46 species were recorded in Tabuk Region [77], in citrus plantations, 33 species were recorded in Al-Jouf Region [57], in plantations of olives and palms, 53 species were recorded in Al-Jouf Region [78]-[83]. Also, the results agreement with the result on Northern Border region, KSA [84] [85] [86] [87]. One of the reasons for the low number and variety of weeds is the process of plowing the soil, annually [88] [89]. Excessive use of herbicides helps the emergence of more resistant weeds [58] [90]. The difference in the number of plant species, recorded in this study and the number of plant species recorded in previous studies on other regions in Saudi Arabia, is due to many reasons; the most important of which is the difference in natural crops in addition to many other environmental factors affecting each region.

Asteraceae, Poaceae and Zygophyllaceae were the most frequent families in farms of Christ's thorn jujube and Palm in Ad-Dawadimi. These results are largely consistent with many studies concerned with studying agroecosystems in other regions within Saudi Arabia [57] [80] [81]. The emergence of the Poaceae family may be the result of deterioration in the agricultural environment [91]. In addition, the Poaceae family is known to be tolerant of environmental extremes [92] [93] [94]. The result showed that the dominant life span is annuals, as well as, the prevailing life form is therophytes in this study. These results are consis-

tent with many previous studies done on other agricultural environments in other regions within Saudi Arabia [54] [55] [56] [57] [77] [81] [82]. This might be due to many of the factors that characterized annuals (therophytes), the most important of which was the shortening of their life cycle and the possibility of completing their life cycle in difficult environmental conditions [95]. In addition, therophytes can form flowers in a short time [96]. Moreover, therophytes can complete seed formation without the need for a visiting pollinator [97].

Saharo-Sindian and Saharo-Sindian-Sudano-Zambezian regions were the most frequent floristic categories in this study. These results correspond to [83] [98] [99]. This is due to the fact that these plants are important indicators of desert environments, which are characterized by harsh conditions.

A total of 15 soil parameters were analyzed in all the studied stands. TWINSPAN and DCA analyses were done to organize data and divide the studied stands into ecologically similar groups. Each group of stands has their *own* plant indicators, as well as, soil factors affecting them. The results showed that the studied stands were divided into two main groups: palm farms stands (10 stands) and Christ's thorn jujube farms stands (ten stands).

6. Conclusions

In this study, weed communities found in date palms and Christ's thorn jujube farms in Ad-Dawadimi Governorate, Saudi Arabia were evaluated. 60 species belonging to the 20 plant families were recorded. The most frequent families were Asteraceae, Poaceae and Zygophyllaceae. The dominant life span is annuals whereas therophytes is the dominant life form. 15 soil factors were analyzed in the studied stands. DCA and TWINSPAN analyses were accomplish to classifying data.

Studying the agroecosystems, to know their components and the relationship between all of these components, helps a lot in achieving the highest productivity of different crops. It also helps in choosing the best methods to control the growth of weeds.

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Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

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