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Weed survey on potato crop in Khartoum state, Sudan

B. Sc. (Honors) Graduation Research Project in Plant Protection

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INCEPTION

أية من القران الكريم

{ وقل إعملوا فسيرى الله عملكم ورسوله والمؤمنون }

صدق الله العظيم.

سورة التوبة ...أية 105

Dedication

To whom are the reasons of my life to those who have made everything for me in order to achieve this level of education

My dad and mom

To my brothers and sisters and their children

I dedicate my effort in this study to them

Ahmed Eltayep.

Acknowledgment

All my thanks and prays to “Allah”, who gave me strength and patience to complete this research.

Thanks to my teacher father of generations Professor mokhtar Abdul Aziz Mohamed Osman with his helpful supervision, professional guidance, excellent suggestion and continuous support and encouragement through the entire period of this study.

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Abstract:-

A weed survey was conducted in sex locations in Khartoum area during the winter season of 2016/2015 to determine the most prevalent weed species associated with potato plant (*solanum tuberosum* L.).

A stratified random sampling procedure was adopted, and each location was divided into fields of which 10 were randomly selected. Number of individual weed species was determined in 10 quadrates, each 1 m^2. The field density, field frequency, field uniformity, relative field density, relative field frequency, relative field uniformity and relative abundance of the species were determined. The data revealed the presence of 23 species of annual and perennial weeds belonging to 19 families. The highest number of species occurred in JaziretIslang and soba while the lowest was recorded in JaziretWawisi .*purpleNutsedge ,Barnyard grass, caffir cabbage, Bermudagrass ,porselane,* occurred at high relative abundance.Species with moderate relative abundance were *M* ilk weed ,Sweetignal .The other species occurred in few locations and exhibited low to very low relative abundance.

الخلاصة

أجرى حصر للحشائش فى سته مواقع بمنطقة الخرطوم خلال الموسم الشتوى لعام 2015 /2016 لتحديد أنواع الحشائش الشائعة و السائدة و التى ترافق زراعات محصول البطاطس .تم إستخدام نظام العينة الطبقية العشوائية فى أخذ العينات و قسم كل موقع الى حقول واختيرات عشرة منها عشوائياً . حدد عدد الحشائش لكل نوع فى عشرمربعات خشبيه مساحته متراً مربعاً قدرت . كثافة الحقل، التكرار، التجانس، الكثافة النسبية، التكرار النسبى، التجانس النسبى والغزارة النسبية للحشائش تم تقديرها.

بيانات الحصر أظهرت وجود 23نوع من الحشائش الحولية والمعمرة وتنتمى !الى 19عائلة.سجل أكبرعدد لأنواع الحشائش فى الجزيرة اسلانج وثوبا بينما أدناه كان فى جزيرة واؤسي . حشائش ، والسعدة، الِدفرة،التمليكة ، ظهرت بغزارة نسبية عالية. بينما حشائش ، النجل ،ام كويعات ،رجلة الخلاء، ام سلعلع ، رصدت بغزارة نسبية معتدله ،الأنواع الأخرى المتبقية من الحشائش فى موقع قليل بغزارة نسبية قليلة إلى قليلة جداّ

CHAPTER ONE

INTRODUCTION

The potato plant (Solanum tuberosum) is a member of the Solanaceae, origin shade family, a family of flowering plants that also includes the eggplant, mandrake, deadly nightshade or belladonna, tobacco, tomato, and petunia. Its starchy tubers (stem thicken end for use as a storage organ), called potatoes, are one of the world's most commonly grown and important food crops.

Potatoes–S. tuberoses(Hamilton (2005).Potato (S. tuberosumL.) With the annual production of 3.6x108 Trunks as the fourth most important crop in with world (Anonymous, 2012).

The potato was originally believed to have been domesticated independently in multiple locations(University of Wisconsin- Madison,(2005) . but later genetic testing of the wide variety of cultivars and wild species proved a single origin for potatoes in the area of present-day southern Peru and extreme north western Bolivia (from a species in the Solanumbrevicaulecomplex), where they were domestic ate approximately 7,000–10,000 years ago Spooner, (2005); John, (2005) and Office of International Affairs(1989).

In Sudan the area around Khartoum, the capital of the Sudan, accounts forover70 percent of the country's potato production(Geneif,1986).Located at the confluence of the Blue and White Nile, Khartoum receives less than 300millimeters(mm) of rain annually, practically all of it from May to October. The average maximum temperature is over 37°C for ten months of the year and over 34°C for the remaining two, December and January. Soils are generally of all uvialorigin, ranging in texture from heavy clays to lighter silty and sandy loam. The siltysoils are generally preferred for potato cultivation.

Until lately, weeds were not a serious constraint to crop production in Khartoum Sudan. However, use of uncertified seeds, animal grazing and flooding of the River Nile led to spread of some serious annual weeds, such as solanum**tuber sum** ,- Potato (Solanumtubersum L.)with theannual production of 3.6 x108T ranks as the fourth most important crop in the world (Anonymous, 2012).

Weeds became one of the main constraints in crop production in the Khartoum State and elsewhere in the Sudan. They reduce yield and indirectly interfere with the use of land and water resources and adversely affect human welfare (Radoservich*et et al*. 1997; Ali 2003; Hamada *et al*. 2009; Mukhtarand and Elamin 2011).

Aweed survey methods have been introduced by many scientists. The method used by Thomas (1985) is more effective in determining the relative abundance of each species in the community (Moeini*et et al*.2008).

The generated data help in understanding the size and extent of the problems that may arise due to weeds and in developing management practices. Unrestricted weed growth reduced the seed and oil yield of Bulgarian corinder (*Coriandrumsativum* L. Cv. S33**)** by 30.3% (Kotharit*et et al.*, 1989). Weedy wheat yield reduced as weed competition period was increased from two to eight weeks, primarily because the plants of wheat under competitive stress produce less numbers of tillers and panicles, shorter panicles and fever grains per panicle (Okafor, 1987). Ismail and Hassan (1988) indicated that weed competition reduced barely yield by 18.

A weed survey was, therefore, conducted in different locations in khartomum area to determine the most common and prevalent weed species associated with potato.

CHAPTER TWO

LITERATURE REVIEW

2.1 potato (Solanmtuberosum):-

2.1.1 Taxonomy:-

Potato plant (S.tuberosum.) belongs to the family solanaceae , Order solanales (Dodds, 1962). Update for It by the flora of north Americe expertise Network in connection with an update for us da plants (2007-2011).

2.1.2 Common name:

The common name of it is Irish potato (Ugent, 1967).

2.1.3 Potatos nutritive value:

Potato plant is an important tubercles crop in the Sudan. Millions of people particularly depend on potato plant as an important food. Potato may be used for its nutritional valueor processed for its starch content nutritionally,potatoes are best known for their carbohydrate content (approximately 26 grams in a medium potato).The predominant form of this carbohydrate is starch .A small but significant portion of digestion by enzytially in the stomach and small intestine and so reaches the large intestineessenstially intact .this resistant starch is considered to have similar physiological effectsand health benefits as fiber :It provides bulk ,offers protection against colon cancer ,improvers glucose tolerance and insulin sensitivity s cowers plasma cholesterol and lriglycerideconcenterations, in ceases satiation and possibly even reduces fat storage (Cummings et at 1996;Hulla et al.1998 ;Rabon et al 1994).

the amount of resistant starch in potatoes depend much on preparation methods cooking and then cooling potatoes significant increases resistant starch .for example ,cooking potato starch contains about 7 resistant starch.

2.2 Weeds: definition, classification and economic importance:-

A weed is a plant growing out of place, that is, a plant growing where it is not wanted, a plant interfering with the intended use of land, and a plant with negative value. It interferes with crop production, directly, through competition, parasitism and allelopathy or indirectly through hindering cultural and harvest practices (Lavabre, 1991; Ibrahim, 2005 and Suhair, 2012).

Weeds present a serious problems to crop production in the Sudan .in the Gezira scheme about 34% of the tenants share is cost of weed control of weed. Weeds through competition with crops for water, nutrients, space and light or by allelopathy, lead to serious yield losses. Weeds also act an alternative hosts for many diseases and animal pests (Osama, 1999; Ihsan, 2002 and Nayla, 2003).

Some common methods used to classify weeds are based on i) botanical (taxonomic) characteristics, ii) life history, iii) habitat, iv) physiology, v) Day length plants, vi) degree of undesirability and vii) evolutionary strategy.

By botanical characteristics (taxonomic) weeds are classified into kingdom, divisions (phyla), classes, orders, families, genera and species.

They also are classified as dicotyledons (broadleaves) and monocotyledons (grasses). According to life history plants are classified into annuals, biennials and perennials.

On basis of habitat plants are classified as terrestrial (that is, they are found on land) and aquatic. On physiological basis plants are classified according to photosynthetic pathway into C_3 plants and C_4 plants. According to day length plants are classified into short-day, long-day and day-neutral. According to undesirability they can be classified into noxious and poisonous plants.

By evolutionary strategy they can be classified into stress-tolerators, competitors and ruderals (Radosevich*et et al.,* 1997 and Aldrich and Kremer, 1997). Weeds have been part of the agricultural science, since man first started cultivated crops,more than 10,000,000 years ago and they are still a major problem today. Weeds encompass all types of undesirable plants trees, broad-leaved plants, grasses, sedges, bruches, aquatic plants and parasitic flowering plants (Abdel Marouf, 2004). Weeds cause greater losses than either insects or plant diseases. They are the major barrier to food production and economic development in many regions of the world particularly in underdeveloped countries, lacking machinery and chemicals (Tomador, 2002).

Furthermore, aquatic weeds reduce the efficiency of irrigation canals by hindering water flow and encouraging siltation. Moreover, weeds interfere with crop production in various ways:

1. Weeds decrease yields by competing with the crop directly for the resources of the environment and inputs in terms of water, nutrients, light, space and / or carbon dioxide.

2. Reduce yields by releasing toxic substances or exudates which inhibit crop growth. This is called the allelopathic effect.

3. Act as an alternative hosts for insect pests and diseases that attack crop plants and cause indirect losses.
4. Delay maturity and slowdown the process of harvesting.
5. Depress crop quality by contamination of the harvested product.
6. Increase tendency for some crops to lodge or to go over, flat.
7. Reduce the value of land specially perennials such as bermuda grass and field bindweed and parasitic ones such as dodder.
8. Reduce farm loans.
9. Decrease human efficiency.
10. Increase costs of other pests control.
11. Reduce the quality of livestock products.
12. Increase the cost of labor and equipment.
13. Consume water and generally disrupt efficient farm operation.
14. Cause damage to machinery or clogging of harvest equipment.
15. Waste excessive proportion of farmers' time.
16. Increase loss of water from rivers or irrigation canals by evapotranspiration.
17. Some weeds are reported to be poisonous to man and animals (Mukhtar, 2006 and Suhair, 2012).Perennial weeds cause a major problems in crop production allover the world (Jodies and deboraha, 1991).

Increase in weed population has a direct impact on reduction in crop yield. The duration of weed competition and the time of weed removing have a great influence on crop growth and yield (Rao, 1983).

In some crops, weed infestation during the first 3 to 8 weeks is very critical (Rao, 1983).

Weeds are a major factor influencing crop production in agricultural system in the United States at least 12 million dollars are lost annually due to weed competition with crops(Rao, 1983).

Weeds are not always harmful. Some weeds induce suicidal germination of some parasitic weeds such as *Strigahermonthica*. Weeds can also help in recycling soil nutrients. In addition, weeds are used as human food and animal feed. Moreover, some weeds are important in traditional medicine such as Italian senna and thorn apple (Hamada, 2000).

2.2.1. Effect of weeds in different crops:-

Losses due to weeds are highest about 25% with ordinary control operations in the least developed crop production systems and lowest about 50% in the most highly developed systems (Abdel Marouf, 2004). Average yield losses due to weeds were determined by the FAO to be between 6% and 15% for main crops in the Sudan (Braun *et al*., 1991).

The annual losses of yield due to weeds in sugarcane were found by 20-70% of the potential production in India, by 16-40% in Indonesia and by 25-93% in Philippines. In the Sudan, uncontrolled weed growth was found to decrease cane yield by 44-50% (Omer and Elamin, 1998).

Weeds that are not controlled within two or three weeks after emergence usually affect the final yield. In some crops, weed infestation during the first 3 to 8 weeks is very critical. Losses due to weeds infestation in different crops have been reported by number of researchers (Rao, 1983).

Weedy wheat yield reduced as weed competition period was increased from two to eight weeks, primarily because the plants of wheat under competitive stress produce less numbers of tillers and panicles, shorter panicles and fever grains per panicle (Okafor, 1987). Ismail and Hassan (1988) indicated that weed competition reduced barely yield by 8 and 18% respectively.

The proportion of rice lost because of weed competition will vary, depending on the interaction between different agronomic factors, thus values of between 30% and 74% have been reported from the U.S.A, Japan and south-east Asia (Turner, 1983). In Peru weeds reduced rice yield by 34-68% and in Latin America maize yield was reduced by 53%. In the U.S.A., yield of sugar from cane was reduced by 76% due weed competition (Mukhtar, 1998). Hassain and Kasim (1976) reported that losses of yield caused by weeds in cotton, wheat and maize were 74%, 45% and 21%, respectively in Iraq. Iraq loses more than 30 million Iraqi dinars annually from weed competition. In some vegetable crops such as transplanted onion *(Allium cepa*L.) weeds reduce its production by 26 -48%. (Babiker and Ahmmed, 1986). Adam (1988) and Adam (1989) showed that weed infestation reduced onion bulb yield and potato yield by 62% and 50% respectively.

Losses in sugarcane yield due to weed infestation were 58.1% (Omer and Elamin, 1998). Yield losses more than 98% in onion was recorded in the Gezira Research Station (Elsadig and Abdalla, 1997). The magnitude of damage to the crop depends on the duration and density of the weed infestation and on the relative time of

emergence of the weed and crop (Mukhtar and Hamada, 2011). Mean crop losses due to weed impact are estimated by 25% but may be as high as 50% or even 80% with certain food crops (Lavabre, 1991). Losses sugar cane due to weeds were estimated by 20% -70% of the potential production in India, 16%-40% in Indonesia and 25%-93% in the Philippines (Suhair, 2012). In the Sudan, unrestricted weed growth was found to reduce cane yield by 44% -50% (Omer and Elamin, 1998). Unrestricted weed growth reduced sunflower yield by 44% (Elfatih, 2006).

Unrestricted weed growth reduced sorghum grain yield by 63%-71% (Hassan, 2006 and Elfatih, 2006). Yield reduction from nut grass infestation was 58% in soybean, 6% in cowpea, 12% in sorghum and 6% in maize (Alia, 2003).

2.2.2 Effect of weeds in tubercles crops:-

Weeds compete vigorously with tubercles crops for water, nutrients and light due to the low competitive ability of tubercles crops during the early stages of their growth. For planted rapeseed and swdan grass were evaluated for weed control in potato during atom –year study. Unrestricted weed growth reduced marketable potato yields by 43% -58% (Nasr Eldin, 2009).

2.3. Potato plant and weed competition:-

The effect of weed competition with the potato crop and pruning of roots on R.G.R.RL.GR.and N.A.R.was investigated .pruning checked the growth of plants, the R.G.R and rebuilt their roots and resumed their activities. Weeds compared with the crop and resulted in a slight reduction of R.G.R.and R.L.R. Herbicides are, therefore, of great potential importance to eliminate the early competition due to weeds in potato (Mohamed, 1996 and Abdel Marouf, 2004).The fourth week

after sowing is the most critical stage in crops weed competition, so weeding during this stage gives as high yield as continuous weeding, whereas single weeding earlier (2weeks) or later than the six weeks after sowing have no effect on crop yield (Dawood,1989).

CHAPTER THREE

MATERIALS AND METHODS

3-1- The experimental site:

A survey was conducted in Khartoum State, which is a true Nile roots with extremely low temperature and radiation in winter, Khartoum states located in the center of Sudan is bordered on the northeast side river Nile state and the north west, northern state and the eastern and southern eastern state of Kassala, Gedaref and Madane of the south island and the western side of the white Nile and north kordufan which lies Khartoum State in the north eastern part of the confluence white Nile and blue Nile to be a paint of Nile state lies between longitudes 5.31 – 34 east latitudes 15-16 north almost.

Almessalah state is located at an altitude of 1352 feat above the sea surface and estimate the area of about 2.736 square kilometers. Most of Khartoum state is located in the region climatic semi-desert, while northern areas are located in the desert areas and the climatic of the state of hot to very hot and raining summers and warm and cool, dry winters. Alomtar average 300-200 mlmat.r temperature ranging in the summer season between 40-25 degrees a percentage in the month of july and October continue bicycle temperature drop in the winter between the months of November to march a percentage of 25-15 degrees (M.Ibrahim 2016), (Geonames 2016).

3-2- The survey procedures in Khartoum State:

Weed survey was undertaken in farmers' fields in six areas: fakihashim,jaziretwawisi,jaziretislang,jarapha,soba,jazirettoti (each of more than

54 feddan) (one fed. = 0.42 ha), four weeks after potatotubers sowing in the winter season2015\2016. This period coincided with maximum growth of weeds and ease of their identification. Counts at this time may indicate the size and extent of weed populations. The survey was undertaken using commonly accepted botanical survey methods to locate and identify weeds. The survey methods involved searching, identifying and counting different weed species.

A stratified random sampling procedure, described by Thomas (1985), Mohamed and Mohamed (1992) and Moeini*et al*. (2008), was adopted. The surveyed area in each area was divided into fields, of which 10 were randomly selected. The number of individual weed species was determined in 10 quadrates, each 1 m^2. The data were processed to indicate density, the mean field density, field frequency, field uniformity, relative mean field density, relative field frequency, relative field uniformity and relative abundance of the species (Thomas 1985; Mohamed and Mohamed 1992 and Moeini*et al*.2008).

Density (D) = number of individuals of a certain species (K)/m^2.

$$\text{Mean field density (MFD)} = \frac{\text{Total of each field density}}{\text{Total number of fields}} \times 100$$

$$\text{Field frequency (FR)} = \frac{\text{Number of fields in which species (K) occurs}}{\text{Total number of fields}} \times 100$$

$$\text{Field uniformity (FU)} = \frac{\text{Number of sampling locations in which species (K) occurs}}{\text{Total number of samples}} \times 100$$

$$\text{Relative mean field density for species K } (RMFD_K) = \frac{\text{Mean field density value for species K}}{\text{Sum of mean field density values for all species}} \times 100$$

$$\text{Relative field frequency for species K } (RFR_K) = \frac{\text{Field frequency value for species K}}{} \times 100$$

Sum of field frequency values for all species

Relative field uniformity for species K (RFU_K) =

$$\frac{\text{Field uniformity value for species K}}{\text{Sum of field uniformity values for all species}} \times 100$$

Relative abundance for species K (RA_K) = $RMFD_K + RFR_K + RFR_K$

CHAPTER FOUR

RESULTS and DISCUSSION:

The data revealed the presence of 26 species of annual and perennial weeds belonging to 19 family (table 1). Of these species 22 were dicotyledonous and 4 were monocotyledonous. The Poaceae, Asteraceae, Amaranthaceae, Zygophyllaceae and Vitaceae made up 11.54%, 7.69%, 7.69%, 7.69% and 7.69% respectively of the total number of species. The remaining weed species belonged to 14 other families (table1). Of the 26 recorded species 15 occurred in one or two areas at very low density and were not considered in the analysis and presentation of the result (table1).

The results indicated that the weed flora of Khartoum State was dominated by broad leaved weeds this could be attributed to the use of germinated weed herbicides such as Topic, Topnour and Traxos by farmers more than broad leaved weed herbicides, such as 2.4 – D.

It could also be attributed to the variation of soils types of arable crops, the forming system edaphic factors and because the broad leaved weeds are few preference for feeding by animals than graminae weeds.

The hightest numbers of species (9) occurred in Faki Hashim, Soba and Jeziret Toti while the lowest (6) was recorded in Wawisti. Table (2) *C. rotundus* and *P. oleraceae* prevailed in all areas.

This could attributed to the perennial lifecycles of *C. rotundus* which propagate sexually by seeds and asexually by vegetative organs. These characteristics make their control very difficult, more over they can germinate in different types of soils. The *P. oleraceae* is an annual weed which propagate sexually by seeds in tropical and subtropics climates. Seeds of this weed specie are very difficult to separate

from seeds of various crops, and so they have been sown and harvested along with the crops. In addition this weed disseminate its seeds by animals, farm equipment, wind, water, birds and organic manure.

C. rotundas had highest mean field density (MFD) (70.30) than any of the other species (Table 2). It was followed in descending order by *C. rotundas, E. colona, C. quadrangularis, P. oleraceae,B.aruciformis, C. dactylon and G. gynandra* which attained a MFD of 32.70, 12.6, 10.80, 7.01, 7.00 and 5.95. Other species exhibited a MFD of less than 2.00% (Table2)

Field frequency (FR) of individual species indicated that *C. rotundas* was the most frequent species (94.30%) (Table 3). It was followed by *E. colona, C. dactylon, P. oleraceae, B. aruciformis, X. echinatum, C. quadrangularis and D. stramonium* which had a FR of 77.00%- 33%. Other weed species were of low FR level (27.60%-22.00%) (Table 3).

The maximum field uniformity (FU) (87.60) was achieved by C. rotundus (table4). it was followed in descending order by *E. colona, P. oleraceae, C. dactylon, B. aruciformis,G. gynandra, C. quadrangularis,*which demonstrated a FU of 52%-23.30%. Other weed species attained low FU (17.60%- 7.83%) (Table 4).

C. rotundus had higher relative mean field density (42.10%) than any of the other weed species (Table 5). It was followed in a descending order, by, *P. oleraceae, C. dactylon, B. aruciformis and G. Gynandra* which attained *E. colona* a RMFD of 15.40%- 3.83%. Other weed species displayed a RMFD of less than 2% (Table 5).

Relative field frequency (RFR) of individual species showed that C. rotundus was the most frequent species (12%) (Table 6). It was followed by *E. colona, P. oleraceae,*

C. dactylon, B. aruciformis, G. Gynandra and C. quadrangularis which demonstrated a RFR of 11.40%- 4.98%. Other species exhibited a RMFD less than 4 (Table 6).

The maximum relative field uniformity (RFU) (20.80) was achieved by C. rotundus (Table 7). It was followed, in descending order, by *E. colona, P. oleraceae, B. aruciformis, C. dactylon, G. Gynandra and C. quadrangularis* which displayed a FRU of 11.70%- 6.23%. Other weed species displayed a RFU of less than 4 (Table 7).

C. rotundus had higher relative abundance (RA) (75.70%) than any of the other species (Table 8). It was followed, in a descending order, by *E. colona, P. oleraceae, C. dactylon, C. quadrangularis, B. aruciformis and G. Gynandra* which attained a RA of 40%- 17.40%. Other species exhibited low RA of less than 10% (Table 8).

The important feature of this survey is the method of ranking species on their mean relative abundance. The survey system provided quantitative comparison of the common species.

C. rotundus, E. colona, P. oleraceae and C. dactylon ranked high in the survey. *C. rotundus and C. dactylon* are perennials which combine the advantages of both systems, fast and extensive spread through sexually produced seeds plus firm establishment on the site through vegetative organs which store considerable food reserves for spread and regeneration. The above mention characteristics make their control by hand weeding or herbicides means difficult and accordingly displayed high MFD, FR and FU. On the other hand, *E. colona and P. oleraceae* are annuals which propagate sexually by seeds in tropical and subtropical climates. Seeds of these species are difficult to separate from grains, and so they have been

sown and harvested along with the crops. Also these weeds disseminate their seeds by wild and domesticated animals, farm equipment, wind, water, birds and stable manure before decomposition which is a very common source of weed dissemination. The species with moderate mean relative abundance were C. *quadrangularis, B. aruciformis and G. Gynandra*. The other species exhibited low mean relative abundance (Table 8).

Table 1: Scientific name, English name, and family name of some weed species:

Scientific name	English name	Arabic name	Family name
Cynodon dactylon L. Sorghum	Bermuda grass	Nageel	Poaceae
*Sinapis arvensis L.**	Wild mustaral	Fugaila	Cruifereae
Cyperus rotundus L.	Purple nutsedge	Seida	Cyperaceae
Gynandropsis gynandya	Caffir cabbage	Tamaleka	Capparidaceae
Datura stramonium	Thorn apple	Datura	Solaneceae
*Sonchus oleraceus **	Sow thistle	Moleita	asteraceae
*Solanum dubium **	Poison berry	Gubbein	Solaneceae
Echchino chloacolona	Barnyard grass	Defra	Poaceae
Euphorbia aegyptiaca	Milk weed	Umlebena	Euphorbiaceae
Portulaca oleracea	Porselane	Regla	Portulacaceae
*Cuscuta compestris **	Dodder	Hamol	Cuscutaceae
Brachiaria eruciformis	Sweet signal grass	Um-rekabat	Poaceae
*Cratalaria theliaica **	Smooth orotalaria	Sufaret-Elkhala	Leguminaceae
*Hibiscus trisonum **	Bloder hibiscus	Weket-Elkhala	Malvaceae
Cissus quadrangularis	Granthiman	Um-galagil	Vitaceae
*Pancratium trianthum **	Pancratium lily	Basalelkilab	Acanthaceae
*Corchorus olitrorius **	Dews mallow	Mulukhiat iblees	Tiliaceae
*Zaleya pentandra **	Manding	Rabaa	Aizoaceae
Ocimum basilicum	Sweet basil	Rihan	Lamiaceae
*Amaranthus gracizans **	Whita pigweed caltrops	Lisan alter	Amaranthaceae
*Tribulus terrestris **	Carhops	Derasa	Zygophyllaceae
Xanthium echinatum	Heart leaf cocklebur	Rantoc	Asteraceae
Foeniculum vularemill *	Sweet fennel	Shammarberi	Umbelliferae
*Fagonia critical **	Virgin's mantle	Um-shuwaca	Zygophyllaceae
*Arctoslaphlos **	Uursi	Enabeldeeb	Vitaceae
*Celosia argential **	Kadayohan (tag)	Ras-Elshaib	Amaranthaceae

* occurred in one or two locations at very low density (0.78-0.8)

Table 2: mean field density of common weed species:

Scientific name	FH	JW	JI	J	S	JT	Mean
C.rotundus	38.00	87.00	14.00	130.0	79.00	74.30	70.3
E.colona	27.70	154.00	00.00	00.70	01.70	11.70	32.7
C.quadrangularis	00.00	00.70	71.00	04.00	00.00	00.00	12.6
P.oleracea	05.70	01.00	39.00	00.70	06.30	12.00	10.8
B.aruciformis	03.70	`14.00	00.70	00.00	14.00	09.70	7.01
C.dactylon	11.30	01.00	00.00	02.00	13.70	14.00	7.00
G.gynandya	02.70	00.00	00.30	21.00	04.00	07.70	5.95
E.aegyptiaca	04.33	00.00	00.70	00.00	04.30	00.00	1.55
D.stramonium	00.00	00.00	02.00	01.00	03.30	02.70	1.50
O.basilicum	04.70	00.00	00.00	02.00	01.70	00.00	1.40
X.echinatum	0233	00.00	01.00	00.00	00.00	02.30	0.93
C.olitrorius	01.00	00.70	00.00	00.00	00.00	03.00	0.78

FH:FakiHashim, Jw:JazirtWaisi , JI:JaziretIslang,J: Jarapha, S:soba, JT:JaziretToti

Table 3: percentage of field frequency (FR) of common weed species:

Scientific name	FH	JW	JI	J	S	JT	Mean
C.rotundus	100.00	100.00	066.00	100.00	100.00	100.00	94.3
E.colona	100.00	100.00	000.00	066.00	100.00	100.00	77.0
C.dactylon	066.00	100.00	000.00	066.00	100.00	100.00	72.0
P.oleracea	100.00	066.00	100.00	033.00	033.00	100.00	72.0
B.aruciformis	066.00	066.00	033.00	000.00	066.00	100.00	55.1
D.stramonium	000.00	000.00	033.00	033.00	066.00	066.00	33.0
X.echinatum	066.00	000.00	033.00	000.00	100.00	066.00	44.1
C.olitrorius	066.00	033.00	000.00	000.00	000.00	033.00	22.0
C.quadrangularis	000.00	033.00	100.00	066.00	000.00	000.00	33.1
E.aegyptiaca	100.00	000.00	033.00	000.00	033.00	000.00	27.6
O.basilicum	100.00	000.00	000.00	033.00	033.00	000.00	27.6

FH:FakiHashim, Jw:JazirtWaisi , JI:JaziretIslang,J: Jarapha, S:soba, JT:JaziretToti

Table 4: percentage of field uniformity (FU) of common weed species:

Scientific name	FH	JW	JI	J	S	JT	Mean
C.rotundus	93.00	87.00	53.00	100.0	100.0	93.00	87.6
E.colona	93.00	60.00	00.00	13.00	73.00	73.00	52.0
P.oleracea	53.00	20.00	87.00	13.00	20.00	73.00	44.0
C.dactylon	40.00	27.00	00.00	20.00	60.00	67.00	35.6
B.aruciformis	27.00	53.00	07.00	00.00	33.00	73.00	32.1
G.gynandya	27.00	00.00	07.00	100.0	13.00	33.00	30.0
C.quadrangularis	00.00	13.00	80.00	47.00	00.00	00.00	23.3
X.echinatum	33.00	00.00	07.00	00.00	33.00	33.00	17.6
D.stramonium	00.00	00.00	20.00	20.00	40.00	20.00	15.6
O.basilicum	47.00	00.00	00.00	20.00	13.00	00.00	13.3
E.aegyptiaca	20.00	00.00	13.00	00.00	27.00	00.00	10.0
C.olitrorius	13.00	07.00	00.00	00.00	00.00	27.00	7.83

FH:FakiHashim, Jw:JazirtWaisi , JI:JaziretIslang,J: Jarapha, S:soba, JT:JaziretToti

Table 5: Percentage of relative mean field density (RMFD) of common weed species:

Scientific name	FH	JW	JI	J	S	JT	Mean
C.rotundus	35.00	34.00	10.00	79.20	48.70	46.10	42.1
E.colona	10.40	60.00	00.00	04.27	10.50	07.30	15.4
P.oleracea	05.20	01.00	27.00	04.27	03.90	07.44	8.13
C.dactylon	10.40	00.50	00.00	01.22	08.44	08.70	4.87
B.aruciformis	03.40	05.40	00.48	00.00	08.82	06.02	4.02
G.gynandya	02.50	00.00	00.20	13.02	02.50	04.80	3.83
E.aegyptiaca	04.00	00.00	00.48	00.00	02.70	00.00	1.19
X.echinatum	02.10	00.00	00.69	00.00	02.50	01.44	1.12
O.basilicum	04.30	00.00	00.00	01.22	01.05	00.00	1.09
D.stramonium	00.00	00.00	01.40	00.61	02.05	01.70	0.96
C.olitrorius	00.92	00.27	00.00	00.00	00.00	01.90	0.52

FH:FakiHashim, Jw:JazirtWaisi , JI:JaziretIslang,J: Jarapha, S:soba, JT:JaziretToti

Table 6: Percentage of relative FIELD frequency (RFF) of common weed species:

Scientific name	FH	JW	JI	J	S	JT	Mean
C.rotundus	11.60	18.83	04.14	16.80	10.80	10.40	12.0
E.colona	11.60	18.83	00.00	16.80	10.80	10.40	11.4
P.oleracea	11.60	12.42	12.60	05.53	07.10	10.40	9.94
C.dactylon	07.64	18.83	00.00	11.07	10.80	10.40	9.79
B.aruciformis	07.64	12.42	04.14	00.00	07.10	10.40	6.95
G.gynandya	07.64	00.00	04.14	16.80	03.55	06.85	6.49
C.quadrangularis	00.00	06.21	12.60	11.07	00.00	00.00	4.98
D.stramonium	00.00	00.00	04.14	05.53	07.10	06.85	3.93
X.echinatum	07.64	00.00	04.14	00.00	10.80	06.55	3.76
O.basilicum	11.60	00.00	00.00	05.53	03.55	00.00	3.44
E.aegyptiaca	11.60	00.00	04.14	00.00	03.55	00.00	3.21
C.olitrorius	07.64	06.21	00.00	00.00	00.00	03.42	2.87

FH:FakiHashim, Jw:JazirtWaisi , JI:JaziretIslang,J: Jarapha, S:soba, JT:JaziretToti

Table 7: percentage of relative field uniformity (RFU) of common weed species:

Scientific name	FH	JW	JI	J	S	JT	Mean
C.rotundus	20.70	31.07	13.21	27.24	17.45	14.85	20.8
E.colona	20.70	21.42	00.00	03.54	12.73	11.70	11.7
P.oleracea	11.54	07.14	21.70	03.54	03.50	11.70	9.85
B.aruciformis	07.20	18.92	01.74	00.00	05.76	11.70	7.55
C.dactylon	08.71	09.64	00.00	05.44	10.50	10.70	7.49
G.gynandya	05.90	00.00	01.74	27.24	02.27	05.30	7.07
C.quadrangularis	00.00	04.64	19.95	12.80	00.00	00.00	6.23
D.stramonium	00.00	00.00	04.98	05.44	07.00	03.19	3.43
X.echinatum	07.20	00.00	01.74	00.00	05.76	05.30	3.33
O.basilicum	10.23	00.00	00.00	05.44	02.27	00.00	2.99
E.aegyptiaca	04.35	00.00	03.24	00.00	04.71	00.00	2.05
C.olitrorius	02.83	02.50	00.00	00.00	00.00	04.31	1.60

FH:FakiHashim, Jw:JazirtWaisi , JI:JaziretIslang,J: Jarapha, S:soba, JT:JaziretToti

Table 8: percentage of relative abundance (RA) of common weed species:

Scientific name	FH	JW	JI	J	S	JT	Mean
C.rotundus	67.30	83.40	31.31	123.24	76.95	71.35	75.7
E.colona	57.90	99.85	00.00	18.88	34.03	29.40	40.0
P.oleracea	28.34	17.33	61.10	13.34	14.50	29.54	27.4
C.dactylon	23.75	28.97	00.00	17.73	29.84	29.80	22.2
C.quadrangularis	00.00	11.12	81.35	26.31	00.00	00.00	19.8
B.aruciformis	18.24	36.74	06.36	00.00	21.68	28.12	18.5
G.gynandya	16.04	00.00	06.08	57.06	08.32	16.95	17.4
X.echinatum	16.94	00.00	06.57	00.00	19.06	13.59	9.36
D.stramonium	00.00	00.00	10.52	11.58	16.15	11.74	8.33
C.olitrorius	11.39	08.98	00.00	00.00	00.00	26.73	7.85
O.basilicum	26.13	00.00	00.00	12.19	06.87	00.00	7.53
E.aegyptiaca	19.95	00.00	07.86	00.00	10.96	00.00	6.46

FH:FakiHashim, Jw:JazirtWaisi , JI:JaziretIslang,J: Jarapha, S:soba, JT:JaziretToti

CHAPTER FIVE
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