



Assessments of Weeds of Major Pulse and Oil Crops in West Shoa, Horro Guduru Wollega and East Wollega Zones, Ethiopia

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Article Info

ISSN (online): 2582-7138

Volume: 05

Issue: 04

July-August 2024

Received: 18-04-2024;

Accepted: 23-05-2024

Page No: 77-83

Abstract

The Field survey of major pulse oil crops: *faba bean*, field pea, soybean, ground nut and sesame was conducted in part of Western Oromia in West Shoa, Horro Guduru Wollega, East Wollega and Buno Bedele Zones during 2019 and 2020 main cropping season covering six districts, 41 Kebeles and 91 fields. Frequency, Abundance, Dominancy and Similarity Index, were computed for each weed species. The most dominant families according to frequency and number of weed species were Poaceae, Asteraceae, Commelinaceae and Amaranthaceae. Generally Annual weeds were dominant in all crops and broad leaf weeds dominated over grass and sedge types for most crops. The most frequent and dominant weed species consisted of *Guizotia scaraba* and *Spergula avensis* for *faba bean*; *Guizotia scaraba* and *Raphanus raphanistrum* for field pea; *Ageratum conyzoides* and *Digitaria ternata* for sesame; *Ageratum conyzoides* and *Guizotia scaraba* for groundnut; *Ageratum conyzoides*, and *Guizotia scaraba* for soybean crops fields.

Keywords: Family, Species, Distribution, Frequency, Abundance, pulses, Oil seeds

Introduction

Weeds are one of the major constraints to crop cultivation that can affect crop yield based on their species composition and density (Kropff *et al.*, 1992) ^[5]. Weed infestations also enhance disease development, serve as alternate host for insects and diseases, slow down harvesting, restricting operations, increase the cost of production, reduce the market value of crops and increase the risk of fire in perennial crops, plantation and forest reserves (Palumbo, 2013; Tena *et al.*, 2012) ^[10, 13].

Some weeds also show allelopathic effects on agricultural crops by secreting allelochemicals that suppress their growth and germination (Vissoh *et al.*, 2004; Jabran *et al.*, 2010; Farooq *et al.*, 2011) ^[15, 6, 2]. Although crop yield losses to weeds vary from crop to crop and from region to region, because of various biotic and abiotic factors, it has been estimated that weeds cause a yield loss of about 10% in the less developed country and 25% in the least developed countries (Khan *et al.*, 2015) ^[3].

It has been estimated that farmers in developing countries devote 20 to 50% of their time to weed management. A study by Vissoh *et al.* (2004) ^[15] found that weeds are an important agricultural constraint to farmers in general, and that weed impact is an important contributing factor to keeping smallholders in a vicious circle of poverty. According to Labrada (2009) ^[7], almost 40% of the activities on African crop fields are dedicated to weed control, which is often done at family level, at the expense of women and children who, instead, could spend time and energy on family care and education.

Information on weed density, distribution and species composition may help to predict yield losses and such information helps in deciding whether it is economical to control a specific weed problem (Kropff *et al.*, 1991; Belachew *et al.*, 2015) ^[4, 1]. There is meager information available about the quantity of crop yield losses due to weeds in Ethiopia. Furthermore, the relative importance of common weed species for the major crops and cropping systems is not well documented (Stroud *et al.*, 1989) ^[11] especially in Western Ethiopia. Surveys are commonly used to characterize weed populations in cropping systems (Uddin *et al.*, 2010) ^[14].

Therefore, to develop an effective weed management program, a detailed survey is necessary to address the current weed problems in the field. In addition, survey information is entirely important in devising problem oriented research programs. Hence, this study was initiated to determine the weed flora, distribution and status for the major pulses and oil seeds crops in parts of Western Oromia.

Materials and Methods

Description of the study area

The Field survey was conducted in parts of Western Oromia in West Shoa, Horro Guduru Wollega, East Wollega and Buno Bedele Zones during 2019 and 2020 main cropping season. The survey was conducted in two districts of West Shoa Zone Chalia and Ilu Galan; in one district of Horro Guduru Wollega Zone-Horro; in two districts of East Wollega Zone namely Gida Ayana and Jima Arjo Districts and Chewaka District of Buno Bedelle Zone (Table 1). The annual mean minimum and maximum temperature of the area is 12°C and 27.4°C, respectively, while the annual rainfall is 1415.2 mm. The geographical locations of the surveyed areas were in the range of latitude and longitude of 08°34.70'-09°40.41'N and 036°06.47'-037°29.30'E, respectively.

Field Survey

The six districts had almost near to lowland, midland and highland agro-ecologies lying in altitude range of 1219-2788 m.a.s.l (Table 1). The survey was conducted from 20th to 27th

September for low land; from 16th to 23rd October for mid land and 1st to 8th November 2019 and 2020 for highland areas.

In this area, faba bean production followed by field pea dominates among other pulse and oil seeds. The survey was conducted in 41 Kebeles and 91 fields in the six districts of the four zones. Purposive sampling technique was applied to select Districts. Kebeles were randomly selected from each district based on their representativeness for pulse and oil seeds production in the area. Thirty-one faba bean, 19 field pea, 21 soybean, 12 sesame and eight groundnut samples were (Table 1) assessed for weeds. Adjacent samples of the same crop were at least 4-6 km apart. The weed assessment was made along the two diagonals (in an "X" pattern) of the field from five points using 1m × 1m (1 m²) quadrates with their GPS and soil types.

Farmers were interviewed using pre-structured questionnaires' to collect some relevant information such as weed management practice, varieties, proceeding crop, planting date, fertilizer use and herbicide use and others. Most of sesame and soybean fields were planted to improved varieties whereas faba bean, field pea and ground nut were more of local cultivars.

Frequency (F), Abundance (A), Dominancy (D) and Similarity Index (SI) were computed for each weed species using the method of Thomas (1985). In each field, weed species and their numbers within the quadrates were counted and recorded.

Table 1: Characteristic features of surveyed pulse and oil seeds fields in two Zones, Western Oromia

Zones	Districts	Crops	Altitude (m.a.s.l)	No. field assessed
West Shoa	Chalia	Faba bean	2435-2614	9
		Field Pea	2464-2619	8
	Ilu Galan	Soybean	1704-2615	8
		Mean	1704-2619	24
H/G/Welloga	Horro	Faba bean	2377-2788	13
		Field Pea	2370-2717	11
		Mean	2370-2788	24
East Wollega	Jima Arjo	Faba bean	2347-2476	9
		Soybean	1345-2451	6
	Gida ayyan	Groundnut	1350-1469	8
		Mean	1350-2476	23
Buno Badalle	Chawaka	Sesame	1219-1270	12
		Soybean	1222-1250	7
		Mean	1219-1270	19
		Over all mean	1219-2788	91

m.a.s.l= meters above sea level

Data Analyses

After the quantitative weed measurements, Density, Relative density, Frequency, Relative frequency and Similarity Index were calculated by using the following formulae. The collected data were summarized and analyzed by using SPSS statistical software.

$$\text{Density (D)} = \frac{\text{Total number of a species in all quadrate}}{\text{Total number of quadrates used}}$$

$$\text{Frequency (F)} = \frac{\text{Number of quadrates in which a given species occurs}}{\text{Total number of quadrates used}}$$

$$\text{Relative Density (RD)} = \frac{\text{Density of a given species}}{\text{Total density for all species}} \times 100\%$$

$$\text{Relative Frequency (RF)} = \frac{\text{Frequency of a given species}}{\text{Total frequency for all species}} \times 100\%$$

$$\text{Similarity Index (SI)} = 100 \times \text{Epg}/(\text{Epg} + \text{Epa} + \text{Epb})$$

Where; SI = Similarity index, Epg = number of species found in both locations, Epa = number of species found only in location I. Epb = number of species found only in locations II.

Results and Discussion

Survey of Faba bean fields

Diversity of weeds in faba bean fields

In faba bean fields, 37 weed species belonging to 11 families were identified. Of these, 40.54% and 16.23% of the species belonged to *Poaceae* and *Asteraceae* families, respectively. Family *Commelinaceae* comprised of 8.11% or three weed species. Families *Amaranthaceae*, *Cyperaceae*, *Polygonaceae*, *Brassicaceae* and *Caryophyllaceae* altogether comprised of

27.03% of the weed species recorded in faba bean fields, each family consisting of two species (Table 2).

Table 2: Number of weed families and species identified in faba bean fields

Family	No. of Species
Poaceae	15
Asteraceae	6
Amaranthaceae	2
Commelinaceae	3
Cyperaceae	2
Polygonaceae	2
Leguminosae	1
plantaginaceae	1
Rubiaceae	1
Brassicaceae	2
Caryophyllaceae	2
Total	37

Weed flora of faba bean fields

The survey results also show that broad leaf weeds dominated over grass and sedge weed species. Of the total weed species recorded in faba bean fields, 54.05% were broad leaf; 40.54% were grass types and 5.4% were sedge type species (Table 3). Thirty-three weed species were annuals and the remaining were found to be perennials.

Ten weed species, namely *Spergula arvensis*, *Guizotia scarab*, *Oplismenus compositus*, *Oxygonum sinuatum*, *Plantago lanceolata*, *Dinebra retroflexa*, *Raphanus raphanistrum*, *Galinsoga parviflora*, *Pennisetum polystachion* and *Rumex abvssinicus* occurred at higher frequency value, exceeding 30% whereas 16 species had frequency values of about 15% and 23%; the remaining 11 species had frequency values of 7%. *Spergula Arvensis* and *Guizotia scarab* had the highest frequency value of 69.23% followed by *Oplismenus compositus* (Table 3).

Table 3: Description of Density, Frequency, Relative Density and Relative Frequency of weeds in faba bean fields

Botanical name	Family	Category	Life cycle	Density	Frequency	Relative density	Relative Frequency
<i>Ageratum conyzoides</i>	Asteraceae	Broad leaf	Annual	4.46	15.38	9.25	1.79
<i>Anagallis arvensis</i>	Commelinaceae	Broad leaf	Annual	1.31	23.08	2.72	2.68
<i>Andropogon abyssinicus</i>	Poaceae	Grass	Annual	0.46	15.38	0.95	1.79
<i>Avena Abyssinicus</i>	Poaceae	Grass	Annual	0.38	15.38	0.79	1.79
<i>Bidens pachyloma</i>	Asteraceae	broad leaf	Annual	1.23	15.38	2.55	1.79
<i>Bidens plosa</i>	Asteraceae	broad leaf	Annual	0.31	7.69	0.64	0.89
<i>Celosia trigyna</i>	Amaranthaceae	broad leaf	Annual	0.38	23.08	0.79	2.68
<i>Chenopodium procerum</i>	Amaranthaceae	broad leaf	Annual	0.31	7.69	0.64	0.89
<i>Commelina benghalensis</i>	Commelinaceae	Broad leaf	Annual	0.46	15.38	0.95	1.79
<i>Commelina subulata</i>	Commelinaceae	Broad leaf	Annual	0.38	15.38	0.79	1.79
<i>Cynodon dactylon</i>	Poaceae	Grass	Perennial	0.23	7.69	0.48	0.89
<i>Cyperus esculntus</i>	Cyperaceae	Sedge	Perennial	0.85	7.69	1.76	0.89
<i>Cyperus rotodus</i>	Cyperaceae	Sedge	Perennial	0.62	7.69	1.29	0.89
<i>Digitaria abvssinica</i>	Poaceae	Grass	Annual	1.07	15.38	2.22	1.79
<i>Digitaria ternata</i>	Poaceae	Grass	Annual	0.54	15.38	1.12	1.79
<i>Dinebra retroflexa</i>	Poaceae	Grass	Annual	1.38	38.46	2.86	4.46
<i>Eleusina indica</i>	Poaceae	Grass	Annual	0.46	15.38	0.95	1.79
<i>Eragrostis cilianensis</i>	Poaceae	Grass	Annual	1.43	23.08	2.97	2.68
<i>Erucastrium arabicum</i>	Brassicaceae	Broad leaf	Annual	0.08	7.69	0.17	0.89
<i>Galinsoga parviflora</i>	Asteraceae	broad leaf	Annual	3.69	38.46	7.66	4.46
<i>Galium spurium</i>	Rubiaceae	broad leaf	Annual	0.15	7.69	0.31	0.89
<i>Guizotia scarba</i>	Asteraceae	Broad leaf	Annual	4.50	69.23	9.34	8.04
<i>Kyllinga nemoralis</i>	Poaceae	Grass	Annual	0.43	7.69	0.89	0.89
<i>Medicago polymorpha</i>	Poaceae	Grass	Annual	0.85	15.38	1.76	1.79
<i>Oplismenus compositus</i>	Poaceae	Grass	Annual	3.81	61.54	7.90	7.14
<i>Oxygonum sinuatum</i>	Polygonaceae	Broad leaf	Annual	0.38	53.85	0.79	6.25
<i>Pennisetum polystachion</i>	Poaceae	Grass	Annual	1.42	30.77	2.95	3.57
<i>Phalaris paradoxa</i>	Poaceae	Grass	Annual	2.38	23.08	4.94	2.68
<i>Plantago lanceolata</i>	plantaginaceae	Broad leaf	Annual	1.31	46.15	2.72	5.36
<i>Raphanus raphanistrum</i>	Brassicaceae	Broad leaf	Annual	1.85	38.46	3.84	4.46
<i>Rumex abvssinicus</i>	Polygonaceae	Broad leaf	Perennial	0.08	30.77	0.17	3.57
<i>Setaria pumila</i>	Poaceae	Grass	Annual	0.34	7.69	0.71	0.89
<i>Snowdenia polystachya</i>	Poaceae	Grass	Annual	4.19	7.69	8.69	0.89
<i>Spergula Avensis</i>	Caryophyllaceae	Broad leaf	Annual	0.46	69.23	0.95	8.04
<i>Spilanthes mauritiana</i>	Asteraceae	Broad leaf	Annual	1.31	15.38	2.72	1.79
<i>Stellaria media</i>	Caryophyllaceae	Broad leaf	Annual	0.43	15.38	0.89	1.79
<i>Trifolium rueppellianum</i>	Leguminosae	broad leaf	Annual	2.51	7.69	5.21	0.89
Others				1.77	23.08	3.67	2.68

Weed Similarity Index

The weed flora similarity index of Chalia, Jima Arjo and Horro Districts were above 60% which means 67%-83% similar weed management method can be used to control

weed species composition (Table 4). This suggests that the weed species composition among the different Districts were similar.

Table 4: Characteristic feature similarity index of weed species composition faba bean fields

Districts	Chalia	Jima Arjo	Horro
Chalia	100	79	83
Jima Arjo		100	67
Horro			100

Survey of field pea fields**Diversity of Weeds**

In field pea fields, 30 weed species belonging to 10 families were identified. Of these, 50% and 13.33% of the species

belonged to *Poaceae* and *Asteraceae* families, respectively. Families, *Commelinaceae*, *Polygonaceae* and *Caryophyllaceae* comprised of 20% of the weed species recorded in field pea fields, each family consisting of two species (Table 5).

Table 5: Number of weed families and species identified in field pea fields

Families	No of species	Families	no of species
<i>Poaceae</i>	15	<i>Brassicaceae</i>	1
<i>Asteraceae</i>	4	<i>Cyperaceae</i>	1
<i>Caryophyllaceae</i>	2	<i>Leguminosae</i>	1
<i>Commelinaceae</i>	2	<i>plantaginaceae</i>	1
<i>Polygonaceae</i>	2	<i>Rubiaceae</i>	1
Total			30

Weed flora of field pea fields

The survey results also showed that broad leaf and grass weeds were nearly equally important while only one sedge species was encountered (Table 6). On the other hand, twenty nine weed species were annuals while only one species was found to be perennial.

Five weed species, namely *Raphanus raphanistrum*,

Guizotia scaraba, *Plantago lanceolata*, *Galinsoga parviflora* and *Spergula avensis*, occurred at higher frequency value, exceeding 30% whereas six species had frequency values of about 27% and the remaining species had frequency values of less than 20%. *Raphanus raphanistrum* and *Guizotia scarab* had the highest frequency value of 63.64 followed by *Plantago lanceolata* (Table 6).

Table 6: Description of Density, Frequency, Relative Density and Relative Frequency of weeds in field pea fields

Botanical name	Family	Category	Life cycle	Density	Frequency	Relative density	Relative Frequency
<i>Anagallis arvensis</i>	<i>Commelinaceae</i>	Broad leaf	Annual	1.00	27.27	3.11	3.66
<i>Andropogon abyssinicus</i>	<i>Poaceae</i>	Grass	Annual	0.73	27.27	2.26	3.66
<i>Avena abyssinicus</i>	<i>Poaceae</i>	Grass	Annual	0.55	18.18	1.70	2.44
<i>Avena fatua</i>	<i>Poaceae</i>	Grass	Annual	0.36	18.18	1.13	2.44
<i>Commelina subulata</i>	<i>Commelinaceae</i>	Broad leaf	Annual	0.09	9.09	0.28	1.22
<i>Cyperus rotundus</i>	<i>Cyperaceae</i>	Sedge	Perennial	0.82	18.18	2.54	2.44
<i>Digitaria abyssinica</i>	<i>Poaceae</i>	Grass	Annual	0.73	18.18	2.26	2.44
<i>Digitaria ternata</i>	<i>Poaceae</i>	Grass	Annual	0.75	0.13	65.01	1.30
<i>Dinebra retroflexa</i>	<i>Poaceae</i>	Grass	Annual	2.00	18.18	6.22	2.44
<i>Eleusine indica</i>	<i>Poaceae</i>	Grass	Annual	0.18	9.09	0.57	1.22
<i>Eragrostis ciliaris</i>	<i>Poaceae</i>	Grass	Annual	0.45	18.18	1.41	2.44
<i>Glebionis segetum</i>	<i>Asteraceae</i>	broad leaf	Annual	1.82	18.18	5.65	2.44
<i>Galinsoga parviflora</i>	<i>Asteraceae</i>	broad leaf	Annual	1.82	45.45	5.65	6.10
<i>Galium spurium</i>	<i>Rubiaceae</i>	broad leaf	Annual	0.18	9.09	0.57	1.22
<i>Guizotia scarba</i>	<i>Asteraceae</i>	Broad leaf	Annual	5.00	63.64	15.54	8.54
<i>Lolium temulifolium</i>	<i>Poaceae</i>	Grass	Annual	0.09	9.09	0.28	1.22
<i>Medicago polymorpha</i>	<i>Poaceae</i>	Grass	Annual	0.55	18.18	1.70	2.44
<i>Oplismenus compositus</i>	<i>Poaceae</i>	Grass	Annual	2.00	27.27	6.22	3.66
<i>Oxygonum sinuatum</i>	<i>Polygonaceae</i>	Broad leaf	Annual	0.45	18.18	1.41	2.44
<i>Pennisetum polystachion</i>	<i>Poaceae</i>	Grass	Annual	0.55	18.18	1.70	2.44
<i>Phalaris paradoxa</i>	<i>Poaceae</i>	Grass	Annual	0.45	27.27	1.41	3.66
<i>Plantago lanceolata</i>	<i>plantaginaceae</i>	Broad leaf	Annual	1.27	45.45	3.96	6.10
<i>Polygonum nepalense</i>	<i>Polygonaceae</i>	Broad leaf	Annual	0.36	18.18	1.13	2.44
<i>Raphanus raphanistrum</i>	<i>Brassicaceae</i>	Broad leaf	Annual	3.00	63.64	9.32	8.54
<i>Setaria pumila</i>	<i>Poaceae</i>	Grass	Annual	0.09	9.09	0.28	1.22
<i>Snowdenia polystachya</i>	<i>Poaceae</i>	Grass	Annual	1.09	27.27	3.39	3.66
<i>Spergula avensis</i>	<i>Caryophyllaceae</i>	Broad leaf	Annual	2.18	36.36	6.78	4.88
<i>Spilanthes mauritiana</i>	<i>Asteraceae</i>	Broad leaf	Annual	0.18	9.09	0.57	1.22
<i>Stellaria media</i>	<i>Caryophyllaceae</i>	Broad leaf	Annual	0.45	18.18	1.41	2.44
<i>Trifolium rueppellianum</i>	<i>Leguminosae</i>	broad leaf	Annual	1.27	27.27	3.96	3.66
Others				2.45	54.55	7.63	7.32

Weed Similarity Index

The survey result showed that similarity index value between Diga and Chawaka Districts was 64% which is greater than

60% (Table 7); it can be concluded that the locations exhibited similar weed community and thus, require similar management options.

Table 7: Characteristic feature similarity index of weed species composition in field pea fields

Districts	Chalia	Horro
Chalia	100	82
Horro		100

Survey of soybean fields**Diversity of weeds**

In soybean fields, 25 weed species belonging to 10 families

Table 8: Number of weed families and species identified in soybean fields

Families	No of species	Families	No of species
Poaceae	7	Caryophyllaceae	1
Asteraceae	6	Euphorbaceae	1
Commelinaceae	3	Lamiaceae	1
Amaranthaceae	2	Leguminosae	1
Cyperaceae	2	Solanaceae	1
			25

Weed flora of soybean fields

The results of the survey also showed that broad leaf weeds were dominant over grass and sedge type weeds; 64% of the weeds were broad leaf types, 28% of the species were grass types and 8% were sedge type weeds (Table 9). On the other hand, 23 weed species were annuals while only two species

were identified. Of these, 52% of the species belonged to *Poaceae* and *Asteraceae* families, each family containing seven and six species, respectively; 12% of the species belonged to family *Commelinaceae* and 16% belonged to *Amaranthaceae* and *Cyperaceae* families, each family comprising of two species. Family *Poaceae* appeared to be dominant of all weed families found in soybean fields (Table 8).

were found to be perennials. Eight weed species had frequency value of greater than or equal to 25%, while the remaining 17 species had frequency value of less than or equal to 20%. The species that had maximum frequency value (58.3%) was found to be *Ageratum conyzoides* followed by *Eleusine indica* (Table 9).

Table 9: Description of Density, Frequency, Relative Density and Relative Frequency of weed in soybean fields

Botanical name	Family	Category	Life cycle	Density	Frequency	Relative density	Relative Frequency
<i>Achyranthes aspera</i>	Amaranthaceae	Broad leaf	Annual	0.25	8.33	0.53	1.69
<i>Ageratum conyzoides</i>	Asteraceae	Broad leaf	Annual	18.46	58.33	39.42	11.86
<i>Anagallis arvensis</i>	Commelinaceae	Broad leaf	Annual	1.88	16.67	4.00	3.39
<i>Bidens pilosa</i>	Asteraceae	broad leaf	Annual	1.00	25.00	2.13	5.08
<i>Chenopodium procerum</i>	Amaranthaceae	broad leaf	Annual	0.75	8.33	1.60	1.69
<i>Commonina Bangilansis</i>	Commelinaceae	Broad leaf	Annual	1.38	16.67	2.94	3.39
<i>Cyanotis cristata</i>	Commelinaceae	Broad leaf	Annual	2.63	16.67	5.60	3.39
<i>Cyperus esculntus</i>	Cyperaceae	Sedge	Perennial	0.63	8.33	1.33	1.69
<i>Cyperus rotudus</i>	Cyperaceae	Sedge	Perennial	0.38	8.33	0.80	1.69
<i>Digitaria abvssinica</i>	Poaceae	Grass	Annual	1.13	16.67	2.40	3.39
<i>Digitaria ternata</i>	Poaceae	Grass	Annual	0.25	16.67	0.53	3.39
<i>Eleusine indica</i>	Poaceae	Grass	Annual	3.00	50.00	6.40	10.17
<i>Eragrostis cilianensis</i>	Poaceae	Grass	Annual	0.13	8.33	0.27	1.69
<i>Galinsoga parviflora</i>	Asteraceae	broad leaf	Annual	0.25	8.33	0.53	1.69
<i>Guizotia scarba</i>	Asteraceae	Broad leaf	Annual	5.38	41.67	11.48	8.47
<i>Kyllinga nemoralis</i>	Poaceae	Grass	Annual	1.75	41.67	3.74	8.47
<i>Leucas cephalotes</i>	Lamiaceae	broad leaf	Annual	0.50	25.00	1.07	5.08
<i>Nicandra physalodes</i>	Solanaceae	Broad leaf	Annual	0.38	8.33	0.80	1.69
<i>Oplismenus compositus</i>	Poaceae	Grass	Annual	2.63	25.00	5.60	5.08
<i>Rhyllanthus niruri</i>	Euphorbaceae	Broad leaf	Annual	0.13	8.33	0.27	1.69
<i>Setaria pumila</i>	Poaceae	Grass	Annual	1.00	25.00	2.13	5.08
<i>Sonchus asper</i>	Asteraceae	Broad leaf	Annual	0.50	8.33	1.07	1.69
<i>Stellaria media</i>	Caryophyllaceae	Broad leaf	Annual	1.25	16.67	2.67	3.39
<i>Trifolium rueppellianum</i>	Leguminosae	broad leaf	Annual	1.13	16.67	2.40	3.39
<i>Xanxhium strumarium</i>	Asteraceae	Broad leaf	Annual	0.13	8.33	0.27	1.69

Weed Similarity Index

Similarity index (community index) is the similarity of plant species composition among different districts. The survey result showed that similarity index value between Ilu Galan and Chawaka Districts was 58% which is below 60% (Table 10); it can be concluded that the locations exhibited dissimilar weed community and thus require different management options.

Table 10: Characteristic feature of similarity index of weed species composition in soybean fields

Districts	Ilu Galan	Chawaka
Ilu Galan	100	58
Chawaka		100

Survey of groundnut fields

Diversity of weeds

In ground fields, 19 weed species belonging to seven families were identified. Of these, 63.16% of the species belonged to *Asteraceae* and *Poaceae* families, each family comprising of six species; 21.05% of the species belonged to

Amaranthaceae and *Commelinaceae* families, each family comprising of two species. The remaining three families had each one species. Unlike in other crops, family *Poaceae* appeared to be less dominant in ground nut fields and only six species of it were recorded (Table 11).

Table 11: Number of weed families and species identified in groundnut fields

Families	No of species	Families	No of species
<i>Asteraceae</i>	6	<i>Euphorbiaceae</i>	1
<i>Poaceae</i>	6	<i>Lamiaceae</i>	1
<i>Amaranthaceae</i>	2	<i>Polygonaceae</i>	1
<i>Commelinaceae</i>	2		
Total			19

Weed flora of groundnut fields

The assessment results also showed broad leaf weeds were dominant over grass weeds; 68.42% of the weeds were broad leaf types, 26.32% of the species were grass types whereas only one species of sedge type was encountered (Table 12). On the other hand, 18 weed species were annuals while only

one species was found to be perennial. Thirteen weed species had frequency value of greater than 40%, while the remaining six species had frequency value of less than 30%. Three weed species: *Digitaria ternate*, *Guizotia scarab* and *Ageratum conyzoides* had the highest frequency value of 85.71% (Table 12).

Table 12: Description of Density, Frequency, Relative Density and Relative Frequency of weed in groundnut fields

Botanical name	Family	Category	Life cycle	Density	Frequency	Relative density	Relative Frequency
<i>Ageratum conyzoides</i>	<i>Asteraceae</i>	Broad leaf	Annual	12.57	85.71	33.75	8.82
<i>Amaranthus hybridus</i>	<i>Amaranthaceae</i>	Broad leaf	Annual	0.14	14.29	0.38	1.47
<i>Bidens pilosa</i>	<i>Asteraceae</i>	Broad leaf	Annual	2.29	57.14	6.14	5.88
<i>Chrysocephalum semipapposum</i>	<i>Amaranthaceae</i>	Broad leaf	Annual	0.29	28.57	0.77	2.94
<i>Commelina benghalensis</i>	<i>Commelinaceae</i>	Broad leaf	Annual	3.14	71.43	8.44	7.35
<i>Cynodon dactylon</i>	<i>Poaceae</i>	Grass	Perennial	1.43	71.43	3.84	7.35
<i>Cyanotis cristata</i>	<i>Commelinaceae</i>	Broad leaf	Annual	2.29	57.14	6.14	5.88
<i>Digitaria ternata</i>	<i>Poaceae</i>	Grass	Annual	2.00	85.71	5.37	8.82
<i>Eleusine indica</i>	<i>Poaceae</i>	Grass	Annual	3.00	71.43	8.05	7.35
<i>Galinsoga parviflora</i>	<i>Asteraceae</i>	Broad leaf	Annual	0.86	42.86	2.30	4.41
<i>Guizotia scarba</i>	<i>Asteraceae</i>	Broad leaf	Annual	3.43	85.71	9.20	8.82
<i>Kyllinga nemoralis</i>	<i>Poaceae</i>	sedge	Annual	1.86	71.43	4.99	7.35
<i>Leucas cephalotes</i>	<i>Lamiaceae</i>	Broad leaf	Annual	0.71	42.86	1.92	4.41
<i>Oplismenus hirtellus</i>	<i>Poaceae</i>	Grass	Annual	0.29	28.57	0.77	2.94
<i>Polygonum nepalensi</i>	<i>Polygonaceae</i>	Broad leaf	Annual	0.29	14.29	0.77	1.47
<i>Rhyllanthus niruri</i>	<i>Euphorbiaceae</i>	Broad leaf	Annual	1.71	71.43	4.60	7.35
<i>Setaria pumila</i>	<i>Poaceae</i>	Grass	Annual	0.43	42.86	1.15	4.41
<i>Sonchus asper</i>	<i>Asteraceae</i>	Broad leaf	Annual/Bi	0.43	14.29	1.15	1.47
<i>Xanthium strumarium</i>	<i>Asteraceae</i>	Broad leaf	Annual	0.14	14.29	0.38	1.47

Survey of sesame fields

Diversity of weeds

In sesame fields, relatively fewer weed species were recorded -14 species belonging to seven families were identified. Of these, 28.57% of the species belonged to family *Asteraceae*

where as 57.14% of the species belonged to, *Amaranthaceae*, *Commelinaceae*, *Euphorbiaceae* and *Poaceae* families, each family comprising of two species. Unlike in other crops, family *Poaceae* appeared to be less dominant in sesame fields and only two species of it were recorded (Table 13).

Table 13: Number of weed families and species identified in sesame fields

Families	No of species	Families	no of species
<i>Asteraceae</i>	4	<i>Poaceae</i>	2
<i>Amaranthaceae</i>	2	<i>Convolvulaceae</i>	1
<i>Commelinaceae</i>	2	<i>Leguminosae</i>	1
<i>Euphorbiaceae</i>	2		
Total			14

Weed flora of sesame fields

Broad leaf weeds were dominant over grass weeds; 85.71% of the weeds were broad leaf types whereas the remaining were grass types (Table 14). On the other hand, 13 weed species were annuals while only one species was found to be perennial.

Nine weed species, namely *Digitaria ternata*, *Rhyllanthus niruri*, *Ageratum conyzoides*, *Eleusine indica*, *Bidens pilosa*, *Ipomea lacunose*, *Cyanotis cristata*, *Cylusia tegrina* and *Commelina benghalensis* occurred at higher frequency value, exceeding 40% whereas the remaining species had frequency values of less than 30%. The first three species viz *Ageratum*

conyzoides, *Digitaria ternata* and *Rhyllanthus niruri* had 100% frequency value (Table 14).

Table 14: Description of Density, Frequency, Relative Density and Relative Frequency of weed in sesame fields

Botanical name	Family	Category	Life cycle	Density	Frequency	Relative density	Relative Frequency
<i>Ageratum conyzoides</i>	Asteraceae	Broad leaf	Annual	15.39	100.00	46.74	14.00
<i>Bidens pilosa</i>	Asteraceae	broad leaf	Annual	2.1	71.43	6.38	10.00
<i>Chenopodium album</i>	Amaranthaceae	broad leaf	Annual	0.14	14.29	0.43	2.00
<i>Commelina benghalensis</i>	Commelinaceae	Broad leaf	Annual	1.04	42.86	3.16	6.00
<i>Cylusia tegrina</i>	Amaranthaceae	Broad leaf	Annual	1.04	42.86	3.16	6.00
<i>Cyanotis cristata</i>	Commelinaceae	Broad leaf	Annual	0.57	42.86	1.73	6.00
<i>Digitaria ternata</i>	Poaceae	Grass	Annual	5.39	100.00	16.37	14.00
<i>Eleusine indica</i>	Poaceae	Grass	Annual	2.9	71.43	8.81	10.00
<i>Euphorbia hirta</i>	Euphorbiaceae	broad leaf	Annual	0.43	28.57	1.31	4.00
<i>Ipomea lacunosa</i>	Convolvulaceae	broad leaf	Perennial	0.43	42.86	1.31	6.00
<i>Rhyllanthus niruri</i>	Euphorbiaceae	Broad leaf	Annual	2.53	100.00	7.68	14.00
<i>Spilanthes mauritian.</i>	Asteraceae	Broad leaf	Annual	0.43	14.29	1.31	2.00
<i>Trifolium rueppellianum</i>	Leguminosae	broad leaf	Annual	0.25	14.29	0.76	2.00
<i>Xanthium strumarium</i>	Asteraceae	Broad leaf	Annual	0.29	28.57	0.88	4.00

Conclusions

In the current study, a total of 91 fields were surveyed for weed flora and fauna of pulses and oil crops, and different weed families and species were identified. The importance of each species was determined by calculating the frequency, abundance and dominance values. Generally, annual broad weed leaves dominated over grass and sedge types for most crops. The most dominant families according to frequency and number of weed species were *Poaceae*, *Asteraceae*, *Commelinaceae* and *Amaranthaceae*. The most frequent and dominant weed species consisted of *Guizotia scaraba* and *Spergula Avensis* for faba bean; *Guizotia scarab* and *Raphanus raphanistrum* for field pea; *Ageratum conyzoides* and *Digitaria ternata* for sesame; *Ageratum conyzoides* and *Guizotia scaraba* for groundnut; *Ageratum conyzoides* and *Guizotia scarab* for soybean crops fields.

The current study has documented important weeds of faba bean, field pea, soy bean, ground nut and sesame in representative and potential Agro-ecologies of the respective crops. As the weeds recorded were described in detail - by families, species and frequency, this information can be useful to prioritize weed management research and management strategies to pursue in the future for the various crops and districts. The information generated through this study is further useful to recommend low-cost, effective and easily available weed management methods for farmers.

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