



## RESEARCH PAPER

## OPEN ACCESS

## Weed ecology of *Brassica* fields of Abbottabad and adjoining areas

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### Abstract

Weeds of *Brassica* species, Rapeseed (*Brassica rapa* and *B. napus*) and Mustard (*Brassica juncea*) were explored in 2008-9 in Abbott bad region. For heterogeneity Mansehra and Haripur, were also covered. The project will elaborate weed ecology and will provide guidelines for effective weed control minimizing environmental and economic losses. Weeds were identified, authenticated, preserved, according to standard techniques. Studies on Weed Ecology comprising, Quantitative Characters (Quadrat analysis), Synthetic Characters (Constancy and Presence) and Physiognomic (Life form) were carried out. Seven fields in specific areas were selected. 7 types of weed Communities were established in the study area as a result of Vegetative sampling. 50 weed species were recorded from study area, among them 44 were from Dicot and 6 from Monocot group. Life Form of all species was recorded as *therophytes*. Plants belonged to 18 families: *Euphorbiaceae*, *Poaceae*, *Brassicaceae*, *Plantaginaceae*, *Caryophyllaceae*, *Rosaceae*, *Fumariaceae*, *Fabaceae*, *Papaveraceae*, *Malvaceae*, *Rubiaceae*, *Asteraceae*, *Lamiaceae*, *Apiaceae*, *Boraginaceae*, *Scrophulariaceae*, *Canabaceae*, *Chenopodiaceae*. Abundant species on IVI basis were, *Euphorbia helioscopia*, *Galium aparine*, *Coronopsis didymus* etc. Rare species were, *Myosotis albicans*, *Phalaris major* and *P. minor*, *Poa annua*, *Triticum aestivum*. Very rare species were *Potentilla atrosanguinea*, *Lapsana communis*, *Scandex pecten veneris*, and *Parthenim hysterophorus*. On the basis of Constancy Class, species appearing in close to 50% of the stands (Class: IV-V) belonged to both Rapeseed and Mustard, such as , *Euphorbia helioscopia*, *Coronopsis didymus*, *Fumaria officinalis*, *Lamium amplexicaule*, *Poa annua*. *Anagalis arvensis*, *Avena sativa*, *Canabis sativa* and *Galium aparine*, appeared in less than 50 % of the stands (Class: III-IV). Findings point towards relationship between Quantitative and Synthetic characters.

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## Introduction

In Pakistan, the *Brassica* genus is represented by six cultivated species among which *Brassica rapa* and *B. napus* are categorized as rapeseed (Khan & Munir, 1986). *B. juncia*, *B. carinata* and *B. nigra* are placed in the mustard group. Both the rapeseed species and *B. juncia* among mustards are cultivated in various agro-climatic regions of Pakistan. *Brassica rapa* a valuable crop of subcontinent is cultivated for its multiple uses in Pakistan. It is rich in oil, fiber and proteins, grown as a potherb, and a fodder crop. It is generally sown in the months of October – November and harvested in the months of April to May.

Sufficient research work is done on weed ecology during the last couple of decades. Most of it has been carried out on crops like Rice, Wheat, Maize, Tobacco, cotton, etc. Research is still awaited for *Brassica* crops of Hazara Region. Existing body of work includes matters such as weed incidence in Abbottabad adjoining areas in maize weeds (Afzal *et al.*, 1994) and NPK values in the same region (afzal *et al.*, 2005). In one case weeds of different crops were studied in Abbottabad region but not mustard class (Ibrar *et al.*, 2003). Leaf size spectra of different crop weeds including mustard was carried out in Chakwal Pakistan (Nasir and Sultan). The area was different and nature of study different. Weeds in Potato fields in Hazara region were also studied (Shah *et al.*, 2003). Mansehra was also a target area where noxious weed were studied (Shah and Khan, 2006). No such record of any nature exists so far in this area, that is why this study was undertaken to fulfill the gap in this field. At higher altitudes though in one case Mustard crop was investigated for weeds but not in this particular region (Marwat *et al.*, 2005).

The existing Data reveals that no such record of any kind exist in my area of study, that is *Brassica* fields (Rapeseed and Mustard in Abbottabad and Adjoining areas. In the light of the above facts, weed ecology, based upon Analytical characters comprising Quantitative characters, Synthetic comprising Presence and Constancy and Physiognomic comprising Life form would be established.

The study was undertaken to establish weed diversity of *Brassica* grown in Abbottabad and adjoining areas. Geography, climate and agronomy of Abbottabad and adjoining areas were adopted from NWFP, Development statistics (NWFP, Development statistics, 2009).

The aim and objective of the project is to elaborate weed ecology which will provide guidelines for effective weed control. Abbottabad District being central and representative of same thing. Without identification, their control is difficult and the measures taken disturb ecosystem. It is, therefore imperative to quantify weed ecology and weed plant diversity for Hazara region. The Data gathered would be helpful in obtaining knowledge for crop improvement. Knowledge could be used by local community for improving crop yield by practicing control methods for existing weeds reported and proper management of the crop. This work will help the agronomist to use the area properly, in terms of weed incidence, weed ecology. Successful completion of the project will fill the everlasting gaps of the unavailability of the scientific information and will provide strong baseline for devising weed management strategy for improving *Brassica* yield in Hazara Region. Internationally it is proven that this is a unique and original account of such nature. No such account exists so far in the last 10 years, especially in this region. Some parameters done where weeds of Abbottabad and adjoining areas were in the fields of maize was done. In another study NPK values of maize crop were established in Abbottabad and Haripur areas. (Afzal *et al.*, 1994), (Afzal *et al.*, 2005). No recent record, inclusive of all the parameters together, in the given study area and crop of interest, has ever been documented.

## Materials and method

Weed Ecology was worked out in the study. It was based on collection of species from selected sites in the study area belonging to Abbottabad and adjoining areas of Haripur and Mansehra, comprising fields of *Brassica* genus: *B. napus* & *B. rapa* (rape seed) and *B. juncia* (mustard). Weed Ecology was based upon, Quantitative Characters (Quadrat analysis), Synthetic Characters (Constancy and Presence) and Physiognomic Characters (Life Form).

Weeds were recorded in all sampling units when the crop was in full bloom. Weeds were identified and authenticated. Specimens were preserved according to standard techniques. Dried, poisoned, mounted and finally labeled. Weed data was recorded in terms of, Botanical names, Families, Common names/Local, names, life form and the specific regions they belong to. Seven fields in specific areas were selected and marked as sampling units: A-G. Vegetative sampling of the weeds was carried out on the basis of quadrat method (Hussain, 1992), to establish community types, based upon density frequency and cover (Quantitative characters). Synthetic characters, comprising Constance and presence and physiognomic, comprising Life form (Raunkiaer, 1834) were also worked out. Parameters used are as follows:

Life form, which is based upon the characteristic vegetative appearance of the plant body and its longevity. The general appearance of a community is caused more by the life-form of the most abundant or dominant species, than by any other characteristic of vegetation. Raunkiaer (1834) devised a system of classification of life-form on the basis of perennating buds, which carry the plants through the unfavorable seasons of the year. The extreme case is represented by annuals which survive only in the highly resistant form of dormant seeds. These are Known as therophytes. All the specimens were carefully examined for this feature

#### *Plant identification:*

Weeds were identified; authenticated. Clear identification, taxonomical arrangement and synonymy of plants were after Stewart (1972). Further help was obtained from Ali and Nasir (1976-1986) Expertise at Stuart National Herbarium Islamabad, Pakistan and Herbarium at Hazara University Mansehra, Pakistan were also utilized for this purpose.

#### *Weeds Ecology*

Weed ecology was investigated on the basis of Analytical, Synthetic and Physiognomic characters. Analytical study comprising Quantitative characters such as Density Frequency and cover was carried out by Quadrat method of vegetation sampling (Hussain, 1992).

Data for Quadrat Analysis is then presented in tabulated form. Synthetic Characters comprising Constance and presence and was also worked out based upon method of determining Constancy Class (Hussain, 1992).

Vegetation sampling was done by quadrat method. Quadrat is a sampling unit used for the quantitative study of plant communities. Here 1m<sup>2</sup> dimensions are used. During the sampling of weed species in *Brassica* fields, four quadrat taken, for each sampling unit. Iron nails, and measuring tapes were used for making quadrats. Quadrates were laid down by fixing nails at four points. Rope is tied tightly to the four nails. A distance of twelve steps between each Quadrat was observed. Quadrats are distributed in random manner. All the plant species inside were recorded. Then number of individuals of each species counted, their cover (circumference) measured by the help of measuring tape and measured cover converted into square feet with the help of cover conversion table adopted from Hussain, (1992)

#### *Data Enlist*

Community attributes like density, cover, and frequency and importance value can be calculated, separately for each species by the following formulae:

$$\text{Density (D)} = \frac{\text{Total number of individuals of a species in all the quadrats}}{\text{Total number of quadrats}}$$

$$\text{Relative Density (D3)} = \frac{\text{Total number of a species in all the quadrats} \times 100}{\text{Total number of individuals of a species in all quadrats}}$$

$$\text{Cover (C)} = \frac{\text{Total cover of the individuals of a species in all the quadrates}}{\text{Total number of plants of a species}}$$

$$\text{Relative Cover (C3)} = \frac{\text{Sum of cover (1m}^2\text{) of a species in all the quadrats} \times 100}{\text{Sum of cover (1m}^2\text{) of all species in all the quadrats}}$$

$$\text{Frequency (F)} = \frac{\text{Number of quadrats of occurrence of a species}}{\text{Total number of quadrats used for sampling}}$$

$$\text{Relative Frequency (F3)} = \frac{\text{Frequency of a species} \times 100}{\text{Total frequency of all the species}}$$

$$\text{Importance value index} = \frac{D3 + C3 + F3}{3}$$

All the data of all the sampling units is recorded.

### Data Analysis

After getting the importance value of all the species, the values are arranged in a tabulated form, according to their decreasing values. Name and community is assigned according to the first three to four dominant plants. All the data will be put in a tabulated form in a grand table to determine weeds of *Brassica* fields of study area. The data will include, weeds recorded from sampling units belonging to Rapeseed and Mustard fields from Haripur and Mansehra and Abbottabad district respectively. The Quantitative Data based upon Quadrat method of the study area is analyzed for synthetic characters to determine, whether quantitative characters follow synthetic characters in some pattern.

Synthetic characters in the form of Presence and Constancy are explored. Data recorded in a table will include a complete list of identified plants from the study area comprising additional information in the form of flower colour, habit, common name: English and local, family and life form. Presence and constancy refers to uniformity of a species in number of stands of the same type of community. A plant found in 18 out of 20 stands will have constancy is 90%. The term constancy is a relative expression of the presence or absence of plants of a species in different stands of a community type based on equal area sample. Species may be classified into fine classes of Constancy according to the Percentage of stands in which they occur which are as follows: Class: I- In less than 20% of stands; Class: II-21%-40%; Class: III -41%-60%; Class: IV-61%-80% and Class: V-81%-100%. Species that occur in more than 90% stands are called Constant species (Hussain, 1992).

### Results and discussion

Weeds of *Brassica* fields (Rapeseed & Mustard) were studied as part of the research. Weeds were recorded from various sampling plots having either Mustard (*Brassica juncea*) or Rapeseed (*Brassica napus* & *Brassica rapa*) as the crop of choice. Weeds recorded from Abbottabad, were from *Brassica juncea* (Mustard) and weed species known from Haripur and Mansehra were from *Brassica rapa* and *B. napus* (Rapeseed).

Three sampling units were from Abbottabad (B, G, & C), two from Mansehra (E & F), and two from Haripur (A & D). Weed Ecology comprises studies on Quantitative Characters (Quadrat analysis), Synthetic Characters (Constancy and Presence) and Physiognomic characters (Life Form). 7 community types were established on the basis of IVI values in sampling units: A-G (Table 1).

Weed data was recorded in terms of, Botanical names, Families, Common English names/Local names etc. Life Form of all species was recorded as Therophytes. Abundant, Common, Frequent, Rare and Very Rare species are recorded individually (Table 2). All in all 50 weed species were recorded from study area, 44 from Dicot and 6 from Monocot group. Plants belonged to 18 families: *Euphorbiaceae*, *Poaceae*, *Brassicaceae*, *Plantaginaceae*, *Caryophyllaceae*, *Rosaceae*, *Fumariaceae*, *Fabaceae*, *Papaveraceae*, *Malvaceae*, *Rubiaceae*, *Asteraceae*, *Lamiaceae*, *Apiaceae*, *Boraginaceae*, *Scrophulariaceae*, *Canabaceae*, *Chenopodiaceae*. 8 genera were found to be represented by two or more than two species such as, *Fumaria*, *Melilotus*, *Chenopodium*, *Vicia*, *Medicago*, *Phalaris*, *Ranunculus* & *Verbascum*). Synthetic characters comprising Constancy classes reveals that, *Euphorbia helioscopia*, *Coronopus didymus*, *Fumaria officinalis*, *Lamium amplexicaule*, *Poa annua*, appearing in close to 50% of the stands (Class: IV-V), while *Anagalis arvensis*, *Avena sativa*, *Canabis sativa* and *Galium aparine*, appearing in less than 50% of the stands (Class: III-IV) (Table. 2). Species belonging to Classes III, IV and V are present in both Rapeseed and Mustard usually, while those belonging to Class: I may be present either in Mustard or Rapeseed fields. For example, *Parthenium hysterophorus* and *Scandix pecten veneris* in Rapeseed fields while *Lapsana communis* and *Potentilla atrosanguinea* in Mustard fields. Synthetic characters follow, in some way the pattern of quantitative characters.

Weeds explored here will equip the grower to better control their encroachment upon the resources in the immediate environment of the crop plant. Both Rapeseed and Mustard are very useful from farmer's point of view.

A concerted effort is needed to give credit to this crop in nation building and as an alternate fodder crop and oil seed crop (Chambers, 1952). This approach to evaluate weeds in terms of their ecology, of more than one species of a genus *Brassica*, is rare in this region.

Previously weeds of 5 different crops were explored in Abbottabad region (Ibrar 2003.) Correlation of weeds with KPN and pH of the soils of maize fields of Abbottabad & Haripur was also explored (Afzal *et al.*, 1994) & (Afzal *et al.*, 2006). This study would be a store house of pertinent information on weeds, which would be helpful to future farmers and ecologist.

The record of IVI values derived from quadrat data (Density, Frequency and Cover), Constancy and Presence will throw light on the dominant species of the study area and the concerned personnel will be in a better position to make arrangements for their advent with all the means available.

Conclusion. Weeds of *Brassica* fields in Abbottabad and adjoining areas were studied Vegetative sampling and life form was noted (Therophytes), which came out to be 50, belonging to 18 families. 7 communities were established.

Weeds belonging to constancy class IV and V were noted in both rape seed and mustard. While those belongig to Constancy Class I belonged to either Rape seed or Mustard. Study will help farmers and agronomist to pinpoint which type of weeds effect the crop which is an extremely important and use full crop for life stock and human consumption.

Notifying weeds and quantifying them would help growers to effectively devise method for their control and increase the yield of this crop. Both *Brassica rapa* & *B. rassic napus* (Rapeseed) and *Brassica juncea* (Mustard) are very useful from farmers point of view, economically, for example as fodder, vegetable and as oil seed source. *Brassica* could be used as a cover crop or as a green manure (Gardiner *et al.*, 1999.).

This is a comprehensive study of weeds of Genus *Brassica* and its three species, i.e: *napus* and *Rapa* (Rape seed) *B. juncea* (Mustard). This approach to evaluate weeds of more than one species of a genus *Brassica* is rare in this region.

It is further to be noted that *Brassica* species considered here are usually very allelopathic (Morra *et al.*, 2003) but weed incidence is still there. So they need to be identified and eradicated. *Brassica* could be use as a cover crop rotation programme such study exists in this area, that is why this project was undertaken.

**Table 1.** Community types in the sampling unit.

Sample ID	Community type				IVI values				Dominate Species	IVI values		
	Mustard	Rape	1	2	3	4	1	2			3	4
A	0	1	<i>Pisum sativum</i>	<i>Euphorbia helioscopia</i>	<i>Fumaria officinalis</i>	<i>Malva parviflora</i>	1.612	1.47	1.26	1.2	<i>Pisum sativum</i>	1.612
B	1	0	<i>Vicia faba</i>	<i>Euphorbia helioscopia</i>	<i>Fumaria officinalis</i>		3.091	1.93	1.93		<i>Vicia faba</i>	3.091
C	1	0	<i>Euphorbia helioscopia</i>	<i>Fumaria officinalis</i>	<i>Galium aparine</i>		3.071	2.13	1.891		<i>Euphorbia helioscopia</i>	3.0713
D	0	1	<i>Brassica rapa</i> Var. <i>rapa</i>	<i>Euphorbia helioscopia</i>	<i>Melilotus officinalis</i>		2.24	2.24	2.01		<i>Brassica rapa</i> var. <i>rapa</i>	2.246 9
E	0	1	<i>Mellilitus officinalis</i>	<i>Malvaparvi flora</i>	<i>Capsella bursa pastoris</i>		1.614	1.49	1.47		<i>Melilotus officinalis</i>	1.6149
F	0	1	<i>Canabis sativa</i>	<i>Euphorbia helioscopia</i>	<i>Capsella bursa pastoris</i>	<i>Coronopsi sdidymus</i>	1.497	1.43	1.36	1.3	<i>Canabis sativa</i>	1.4974
G	1	0	<i>Trigonella foenumgræcum</i>	<i>Euphorbia helioscopia</i>	<i>Anagalis arvensis</i>	<i>Coronopsi sdidymus</i>	1.987	1.79	1.737	1.5	<i>Trigonella foenumgræcum</i>	1.987

IVI-Importance Value Index



**Table 2.** Weed Distribution on the Basis of Presence and Constance in the sampling units studied (% Occurrence & Constancy class) and Quadrat Data. (Habit/Common Eng name/Local name, Family name, Flower colour, Life form mentioned against each Botanical name).

SN	Type	Sampling Unit A	Sampling Unit B	Sampling Unit C	Sampling Unit D	Sampling Unit E	Sampling Unit F	Sampling Unit G	% Occure	Consitancy Class/ Quadrat Data	
1	<i>Angalis arvensis</i> Dicot Herb/Red pimpernel/Lindarikasaag <i>Caryophyllaceae</i> , Blue , thero			+			+	+	43%	Class:III(C)	
2	<i>Avena sativa</i> Monocot herb/Oat/Jai, <i>Poaceae</i> , Greenishthero			+			+	+	43%	Class:III(C)	
3	<i>Brassica rapavar.rapa</i> Dicot Herb/Turnip/Shaljam, <i>Brassicaceae</i> ,Whitethero		+		+				29%	Class:II(A-C)	
4	<i>Canabis sativa</i> Dicot Herb/Marajuana/Bhang, <i>Canabinaceae</i> Greenish, thero					+	+	+	43%	Class:III(A-C)	
5	<i>Capsella bursa pastoris</i> Dicot Herb / Sheperd's purse/ -, <i>Brassicaceae</i> ,White,thero				+	+	+		43%	Class:III(A)	
6	<i>Calendula officinalis</i> Dicot Herb/Meri gold / - <i>Asteraceae</i> , Yellow, thero	+		+					29%	Class:II(R-F)	
7	<i>Chenopodium album</i> Dicot Herb/Goosefoot/Bathu, <i>Chenopodiaceae</i> , White, thero	+				+			29%	Class:II(C)	
8	<i>Chenopodium botrys</i> Dicot Herb/Sticky goosefoot/Safaedbathu, <i>Chenopodiaceae</i> , Greenish, White,thero					+			14%	Class: I	(R)
9	<i>Conium maculatum</i> Dicot Herb/Hemlock/ <i>Apiaceae</i> , White, thero					+			14%	Class: I	(C in one)
10	<i>Coriandum sativum</i> Dicot Herb/Coriander/Dhania, <i>Apiaceae</i> ,White thero		+						14%	Class: I	(C in one)
11	<i>Coronopsus didymus</i> Dicot Herb/Lesser summer cress/Gandibooti, <i>Brassicaceae</i> , White, thero	+			+	+	+	+	71%	Class:IV	(C)
12	<i>Cynodon dactylon</i> Monocot Herb/Burmuda grass/Khabal, <i>Poaceae</i> Greenish ,thero						+		14%	Class: I	(F in one Field)
13	<i>Dianthus deltoides</i> Dicot Herb/Maiden pink/ <i>Caryophyllaceae</i> , Pink, thero							+	14%	Class: I	(R)
14	<i>Euphorbia helioscopia</i> Dicot herb / Sun spurge / Dodak , <i>Euphorbiaceae</i> , Greenish ,thero	+	+	+	+	+	+	+	100%	Class:V	(A)
15	<i>Fumaria officinalis</i> Dicot Herb/Common fumitory/ <i>Fumariaceae</i> Purple, thero,	+		+		+	+		57%	Calss:III- IV	(C)
16	<i>Fumaria parviflora</i> Dicot Herb/Fine leaved fumitory/ <i>Fumariaceae</i> , Purple, thero		+						14%	Class: I	(C)
17	<i>Galium aparine</i> Dicot Herb/Goose Grass/Chaptibooti, <i>Rubiaceae</i> White, thero		+	+			+		43%	Class:III	(C)
18	<i>Lamium amplexicaule</i> Dicot Herb/Henbit dead- nettle/Topiwala Saag, <i>Lamiaceae</i> , Purple, thero	+			+	+	+		57%	Calss:III- IV	(C)
19	<i>Lapsana communis</i> Dicot herb/Nipple wort/ Dodak, <i>Asteraceae</i> ,							+	14%	Class: I	(V.R)

SN	Type	Sampling Unit A	Sampling Unit B	Sampling Unit C	Sampling Unit D	Sampling Unit E	Sampling Unit F	Sampling Unit G	% Occure	Consitancy Class/ Quadrat Data	
	Yellow, thero										
20	<i>Malva parviflora</i> Dicot Herb/Mallow/Sonchal, <i>Malvaceae</i> , Pink , thero	+				+			29%	Class:II	(A-C.in 2 Fields)
21	<i>Medicago denticulata</i> Dicot Herb/California burclover/ <i>Fabaceae</i> , White thero			+					14%	Class: I	(C. in oneField)
22	<i>Medicago polymorpha</i> Dicot Herb / California burclover / - <i>Fabaceae</i> ,White,thero		+						14%	Class: I	(C in one Field)
23	<i>Melilotusindicus</i> Dicot Herb/Sweet clover/ Daksinga, <i>Fabaceae</i> Yellow, thero						+	+	29%	Class:II	(C)
24	<i>Melilotus officinalis</i> Dicot Herb/Yellow sweet clover/Singi, <i>Fabaceae</i> Yellow, thero				+	+			29%	Class:II	(A-C.in one Field)
25	<i>Myosotis albicans</i> Dicot Herb, <i>Boraginacea</i> , Blue-Purple thero			+					14%	Class: I	(F in oneField)
26	<i>Pisum sativum</i> Dicot herb/Edible pea/Mattar, <i>Fabaceae</i> , White, thero	+							14%	Class: I	(A.in one Field)
27	<i>Papaver somniferum</i> Dicot herb/Opium poppy/ Gule-e-lala, <i>Papaveraceae</i> , Red, thero		+						14%	Class: I	(F.inOne Field)
28	<i>Phalaris major</i> Monocot Herb / - / Dumbisuttee, <i>Poaceae</i> ,Greenishthero		+						14%	Class: I	(R in one Field)
29	<i>Phalaris minor</i> Monocot Herb/Little seed canary grass/Sitteebooti, <i>Poaceae</i> , Greenish, thero					+	+		29%	Class:II	(R in 2 Fields)
30	<i>Parthenium hysterothorus</i> , Dicot Herb/Carrot Grass/ <i>Asteraceae</i> , Whitish, Thero	+							14%	Class: I	(V.R)
31	<i>Poaannua</i> Monocot Herb/Annual blue grass/ <i>Poaceae</i> , Greenish, thero				+	+	+	+	57%	Class:III-IV	(F in 4 Fields)
32	<i>Potentilla atosanguinea</i> Dicot herb/Himalayan cinquefoil- <i>Rosaceae</i> , Yellow thero		+						14%	Class: I	(V.R)
33	<i>Ranunculus arvensis</i> Dicot Herb/Corn buttercup- <i>Ranunculaceae</i> Yellow, thero			+					14%	Class: I	(C.in oe Field)
34	<i>R. muricatus</i> Dicot herb/Buttercup- <i>Ranunculaceae</i> , Yellow thero		+						14%	Class: I	(R. in one Field)
35	<i>R. repens</i> Dicot herb/Creeping\buttercup- <i>Ranunculaceae</i> Yellow, thero							+	14%	Class: I	(F.in one Field)
36	<i>Raphanus sativus</i> Dicot herb/Radish/Mooli, <i>Brassicaceae</i> , White thero			+	+				29%	Class:II	(F-R in two Fields)
37	<i>Rumax dentatus</i> Dicot herb/Tooth dock- <i>Polygonaceae</i> , Whitish thero				+				14%	Class: I	(C.in one Field)
38	<i>Scandix pectin-veneris</i> Dicot Herb/Shepherd's needle- <i>Apiaceae</i> , White, thero						+		14%	Class: I	(V.R inone Field)
39	<i>Silene conoidea</i> Dicot Herb/Large sand catchfly, Pink, thero	+							14%	Class: I	(F. in one Field)
40	<i>Silybum marianum</i> Dicot herb/Milk thistle- <i>Asteraceae</i> , Purple thero	+			+				29%	Class:II	(V.R-F.in Two Fields)
41	<i>Sonchus oleraceus</i> Dicot Herb/Common sow							+	14%	Class: I	(F. in one Field)

SN	Type	Sampling Unit A	Sampling Unit B	Sampling Unit C	Sampling Unit D	Sampling Unit E	Sampling Unit F	Sampling Unit G	% Occure	Consitancy Class/ Quadrat Data	
	thistle/Chittibooti- <i>Asteraceae</i> , Yellow, thero										
42	<i>Stellaria media</i> Dicot herb/Chick weed/Taloori, <i>Caryophyllaceae</i> White, thero				+		+		29%	Class:II	(C. in Two Fields)
43	<i>Trifolium repens</i> Dicot Herb/White clover/Shaftal, <i>Fabaceae</i> , White, thero						+	+	29%	Class:II	(C –F.in Two Fields)
44	<i>Triticum aestivum</i> Monocot Herb/Wheat/Kanak (Ghandum, <i>Poaceae</i> , Greenish, thero						+		14%	Class: I	(F. in one Field)
45	<i>Trigonella foenumgraecum</i> Dicot herb/Fenugreek/ Methi, <i>Fabaceae</i> , Yellow, thero							+	14%	Class: I	(A. In one Field)
46	<i>Verbascum thapsus</i> Dicot Herb/Common mullien- <i>Schrophulariaceae</i> , Yellow, thero		+						14%	Class: I	(C.in one Field)
47	<i>V. tenuseta</i> Dicot Herb- <i>Schrophulariaceae</i> , Yellow, thero							+	14%	Class: I	(F.in one Field)
48	<i>Veronica persica</i> Dicot herb/Common speedwell/Palkonwalasaag <i>Plantaginaceae</i> , Blue, thero					+	+		29%	Class:II	(F-R in two Fields)
49	<i>Vicia faba</i> Dicot Herb/Broad bean- <i>Fabaceae</i> , Pink, thero		+						14%	Class: I	(A.in one Field)
50	<i>V. sativa</i> Dicot Herb/Broad bean- <i>Fabaceae</i> , Purple thero					+			14%	Class: I	(C.in one Field)

A-Abundant, C-Common, F-Frequent, R-Rare and VR-Very Rare; ClassI- In less than 20% of stands, Class: II- 21%-40%. Class:-III -41%-60%, Class: IV-61%-80% & Class: V-81%-100%.

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