RESULTS AND DISCUSSION

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A) Weed Floristics

Weed floristics is considered as a basic work in weed biology. It helps in determining weed competition with crops and losses caused by weeds. It also provides useful information for weed control. However it has been observed that weed is not specific to any particular habitat or crop thus the weeds of cultivated fields are not further classified into weeds of paddy fields or wheat fields. The wetlands around permanent water resources as well as irrigated lands in particular form rich sources for weeds and are rich in weed flora also whereas the drylands harbours drought resistant weeds.

Weed floristic survey around Satara was conducted in both Rabi and Kharif season during the year 2006-07.Weed flora composed of hundred and one genera and 26 families. Polypetalae is represented by 22 genera while gamopetalae and apetalae represented by 42 and 16 genera respectively.

a) Rabi Weed Flora

Seventy-four weed species representing twenty-two families of angiosperms were collected in rabi fields of study area. Among them, 63 were dicotyledonous weeds of which 34 belongs to gamopetalae while 15 and 14 belongs to polypetalae and apetalae respectively. Proportion of dicotyledonous weeds to monocotyledonous weeds is 5.3:1. Major weed contributing families were Asteraceae (19 genera and 19 species), Euphorbiaceae (5 and 8), Fabaceae (5 and 7), Amaranthaceae (3 and 5) and Lamiaceae (3 and 4).

Euphorbia was competent weed donar genus. It contributed 4 species *Euphorbia geniculata, Euphorbia hirta, Euphorbia rosea, Euphorbia zernoides. Euphorbia* is followed by *Amaranthus* genus it contributed 3 species *Amaranthus cruentus, Amaranthus spinosus, Amaranthus viridis. Indigophera* contributed 2 species, *Indigophera glandulosa, Indigophera linifolia.* Genera like *Crotalaria, Leucas, Portulaca, Rungia, Sida* contributed two species each to the weed flora. Caesalpinaceae, Chenopodiaceae, Molluginaceae, Oxalidacae, Primulaceae, Scrophulariaceae, Solanaceae, Tiliaceae, Verbenaceae contributed one weed species each (Table -3, Figure-3).

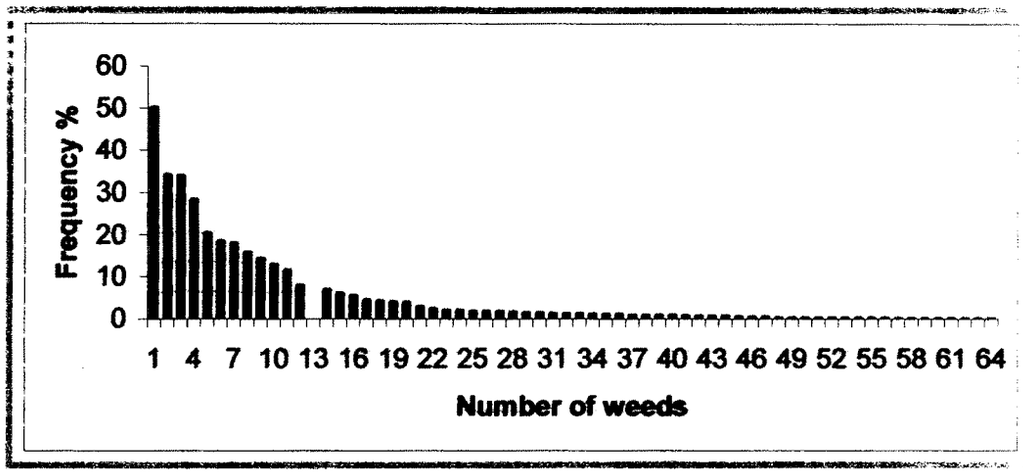
Table 3-: Weed Diversity And Ecological Status Of Rabi Dicot Weed Flora From Satara.

Sr. No.	Name of the weed	Family	D	A	F (%)	F. C.
1	*Parthenium hysterophorus* L.	Asteraceae	4.63	9.21	50.28	C
2	*Euphorbia geniculata* Orteg.	Euphorbiaceae	2.30	6.71	34.27	B
3	*Portulaca oleracea* L.	Portulacaceae	2.39	7.03	34.08	B
4	*Euphorbia hirta* L.	Euphorbiaceae	0.96	3.39	28.43	B
5	*Alternanthera sessilis* (L.) R.Br.	Amaranthaceae	0.86	4.22	20.52	B
6	*Euphorbia rosea* Retz.	Euphorbiaceae	0.47	2.56	18.64	A
7	*Ageratum conyzoides* L	Asteraceae	1.29	7.15	18.07	A
8	*Amaranthus viridis* L.	Amaranthaceae	0.71	4.48	16.00	A
9	*Physalis minima* L.	Solanaceae	0.4	2.79	14.50	A
10	*Launaea procumbens* (Roxb.) Ramayya & Rajgopal	Asteraceae	1.003	7.72	12.99	A
11	*Amaranthus spinosus* L.	Amaranthaceae	0.52	4.52	11.67	A
12	*Tridax procumbens* L.	Asteraceae	0.31	3.88	8.09	A
13	*Celosia argentea* L.	Amaranthaceae	0.21	2.97	7.1	A
14	*Amaranthus cruentus*L.	Amaranthaceae	0.34	4.89	6.96	A
15	*Argemone mexicana* L.	Asteraceae	0.16	2.81	6.02	A
16	*Lagascea mollis* Cav.	Asteraceae	0.15	2.7	5.64	A
17	*Phyllanthus amarus* Schumach & Thonn	Euphorbiaceae	0.09	2.04	4.51	A
18	*Chenopodium album* L.	Chenopodiaceae	0.16	3.86	4.33	A
19	*Sonchus oleraceus* L.	Asteraceae	0.18	4.5	4.14	A
20	*Convolvulus arvensis* L	Convolulaceae	0.25	6.33	3.95	A
21	*Blumea lacera* (Burm.F.)DC	Asteraceae	0.11	3.75	3.01	A
22	*Bidens pilosa* auct non L.	Asteraceae	0.04	1.84	2.44	A
23	*Phylocephalum tenue* (Wt.ex.Cl) Narayana	Asteraceae	0.02	1.36	2.07	A
24	*Xanthium indicum* Koen	Asteraceae	0.03	1.63	2.07	A
25	*Eclipta prostrata* (L)L.	Asteraceae	0.05	2.9	1.88	A
26	*Sida acuta* Burm f.	Malvaceae	0.06	3.4	1.88	A
27	*Corchorus aestuans* L.	Tiliaceae	0.04	2.3	1.88	A
28	*Portulaca quadrifida* L.	Portulaceae	0.07	4.66	1.69	A
29	*Rungia elegans* Dalz.	Acanthaceae	0.041	2.75	1.50	A
30	*Pentanema indicum* (L.) Ling	Asteraceae	0.06	4.37	1.50	A
31	*Acalypha indica* L.	Euphorbiaceae	0.01	1.42	1.31	A
32	*Sida rhombifolia* L.	Malvaceae	0.030	2.28	1.31	A
33	*Mollugo pentaphylla* L.	Molluginaceae	0.016	1.28	1.31	A
34	*Cassia tora* L.	Caesalpinaceae	0.03	2.66	1.12	A

35	*Chrozophra rootleri* (Geis) Juss.	Euphorbiaceae	0.02	2	1.12	A
36	*Crotalaria orixensis* Willd.	Fabaceae	0.01	2	0.94	A
37	*Leucas aspera*(Willd.)Link.	Lamiaceae	0.01	1.2	0.94	A
38	*Leucas ciliata* Benth.	Lamiaceae	0.04	4.6	0.94	A
39	*Stemodia viscosa* Roxb.	Scrophulariaceae	0.01	1.2	0.94	A
40	*Ipomea barlerioides* Benth & Cl.	Convolulaceae	0.03	4	0.75	A
41	*Lathryrus sativus* L.	Fabaceae	0.01	2.5	0.75	A
42	*Orthosiphon pallidus* Royle	Lamiaceae	0.009	1.25	0.75	A
43	*Lantana camara* L.	Verbenaceae	0.007	1	0.75	A
44	*Rungia pectinata* (L.) Nees	Acanthaceae	0.009	1.66	0.56	A
45	*Ricinus communis* L.Erand	Euphorbiaceae	0.005	1	0.56	A
46	*Alysicarpus heyneanus* Wt & Arn.	Fabaceae	0.009	1.66	0.56	A
47	*Caesulia axillaris* Roxb.	Asteraceae	0.02	7	0.37	A
48	*Emilia sonchifolia* (L.) DC.	Asteraceae	0.01	3.5	0.37	A
49	*Siegesbeckia orientalis* L.	Asteraceae	0.01	3	0.37	A
50	*Spilanthus acmella* auct.non.Murr.	Asteraceae	0.005	1.5	0.37	A
51	*Crotalaria filipes* Benth	Fabaceae	0.003	1	0.37	A
52	*Centaurium meyeri* (Bunge) Druce.	Gentiniaceae	0.003	1	0.37	A
53	*Exacum pedunculatum* L.	Gentiniaceae	0.003	1	0.37	A
54	*Salvia plebeia* R.Br.	Lamiaceae	0.005	1.5	0.37	A
55	*Oxalis corniculata* L.	Oxalidacae	0.009	2.5	0.37	A
56	*Justicia betonica* L.	Acanthaceae	0.001	1	0.18	A
57	*Synedrella nodiflora* (L.) Gaertn.	Asteraceae	0.001	1	0.18	A
58	*Vernonia cinerea* (L) Less.	Asteraceae	0.001	1	0.18	A
59	*Euphorbia zernoides* Boiss.	Euphorbiaceae	0.001	1	0.18	A
60	*Desmodium scorpiurus* (Sw.) Desv .	Fabaceae	0.001	1	0.18	A
61	*Indigophera glandulosa* Wendl.	Fabaceae	0.001	1	0.18	A
62	*Indigophera linifolia* (L.f.) Retz.	Fabaceae	0.001	1	0.18	A
63	*Anagallis arvensis* L.	Primulaceae	0.005	3	0.18	A

(A-Abundance, D- Density, F-Frequency, F.C.-Frequency class)

Figure 3 – Graph Showing Frequency % Of Dicot Weed Species From Rabi Crop Fields Around Satara.



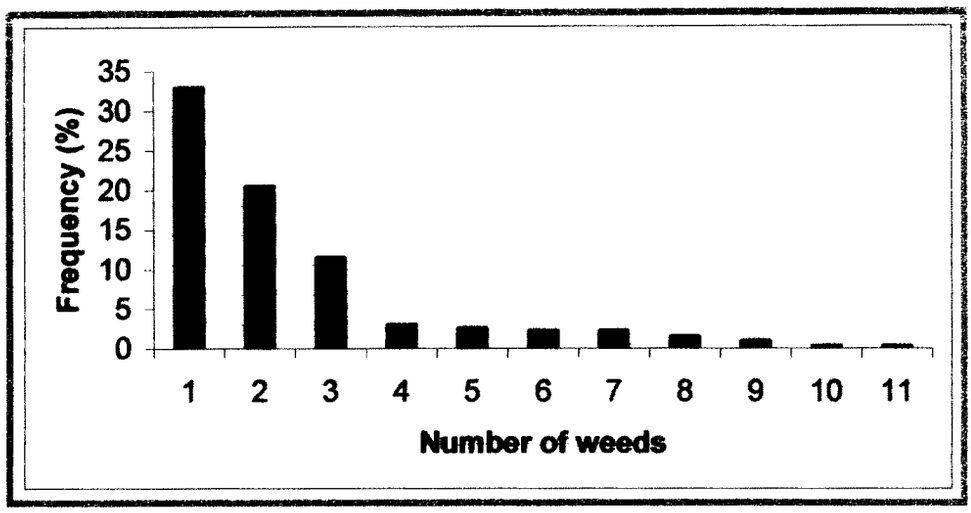
Monocotyledonous weeds were contributed by Poaceae, Cyperaceae and Commelinaceae families. Weed contributing monocotyledonous genera were *Brachiaria, Commelina, Cynadon, Cyperus, Dichanthium, Digitaria, Dinebra, Echinochloa, Eragrostis, Sporobolous, Theleopogan etc.* (Table-4, Figure -4).

Table 4-: Weed Diversity And Ecological Status Of Rabi Monocot Weed Flora From Satara.

Sr. No.	Name of the weed	Family	D	A	F (%)	F.C.
1	*Brachiaria eruciformis* (J.E.Sim)Griseb.	Poaceae	9.59	26.36	32.96	B
2	*Cyperus rotundus* L..	Cyperaceae	8.92	34.17	20.52	B
3	*Theleopogan elegans* Roth.	Poaceae	0.48	1.88	11.48	A
4	*Dichanthium annulatum* (Forssk) Stapf.	Poaceae	0.55	8.43	3.0	A
5	*Commelina forsskalaei* Vahl.	Commelinaceae	0.04	1.78	2.63	A
6	*Eragrostis Japonica* (Thunb.) Trin.	Poaceae	1.03	10.28	2.26	A
7	*Dinebra retroflexa(Vahl) panz*	*Poaceae*	0.93	24.41	2.25	A
8	*Echinochloa colona* (L.) Link.	Poaceae	0.99	18.25	1.50	A
9	*Cynadon dactylon* (L.) Pers	Poaceae	0.02	1.2	0.94	A
10	*Digitaria cilliaris* (Retz) Koel.	Poaceae	0.02	2.5	0.37	A
11	*Sporobolous indicus* (Retz.) Jovet & Guedes	Poaceae	0.07	1.5	0.36	A

(A-Abundance, D- Density, F-Frequency, F.C.-Frequency class)

Figure 4 – Graph Showing Frequency % Of Monocot Weed Species From Rabi Crop Fields Around Satara.



Sandhya deshpande (1993) in her Flora of Mahabaleshwar and Adjoinings, Maharashtra has enlisted 57 weeds from cultivated fields. Jain *et al.* (1997) reported fourteen weed species in rabi season, at Research farm of JNKVV, Jabalpur (M.P.) Rothe and Deshmukh (1997) surveyed common weeds of Kharif and Rabi crop fields from Akola District. They reported 66 weeds from Akola district. Naik (1998) enlisted 22 weeds in Rabi season and Singh *et al.* (2000) has given a list of 519 weeds in his flora of Maharashtra.

Following thirteen weeds from present work found common with the work of Deshpande, *Ageratum conyzoides, Anagallis arvensis, Caesulia axillaris, Chrozophra rootleri, Commelina forsskalaei, Eleusine indica, Ipomea hederifolia, Leucas aspera, Linum mysurense, Physalis minima, Sida rhombifolia, Sonchus oleraceous* and *Pentanema indicum.* While six weeds found common in the work of Rothe and Deshmukh, such as, *Anagallis arvensis, Argemone mexicana, Chrozophra rootleri, Exacum pedunculatum, Sonchus oleraceous and Stemodia viscosa.* Seven weeds are common in present work and Jain *et al's.* work namely, *Alternanthera sessilis, Anagalis arvensis, Chenopodium album,* Convolulus arvensis, *Cynadon dactylon, Cyperus rotundus, Eclipta alba.* While comparing the present work with Marathwada following five weeds were found common namely, *Ageratum conyzoides, Euphorbia spp., Exacum pedunculatum, Pentanema indicum, Stemodia viscosa.* Weed flora of study area shows maximum simmilarity with the weed flora of Maharashtra. 53 weed species out of 76 from rabi fields of study area are included in the list given by Flora of Maharashtra.

B) Kharif Weed Flora

Eighty weed species representing twenty-six families of angiosperms were recorded in Kharif fields of study area. Gamopetalae was the major weed-contributing group of dicotyledones. It contributed 28 weed species while Polypetalae and apetalae contributed 18 and 16 weed species respectively. Proportion of dicotyledonous weeds to monocotyledonous weeds is 2.8:1. Major weed contributing dicot families were Asteraceae (16 genera and 16 species), Euphorbiaceae (4 and 6), Amaranthaceae (4 and 6), Fabaceae (3 and 4) and Convolulaceae (3 and 3).

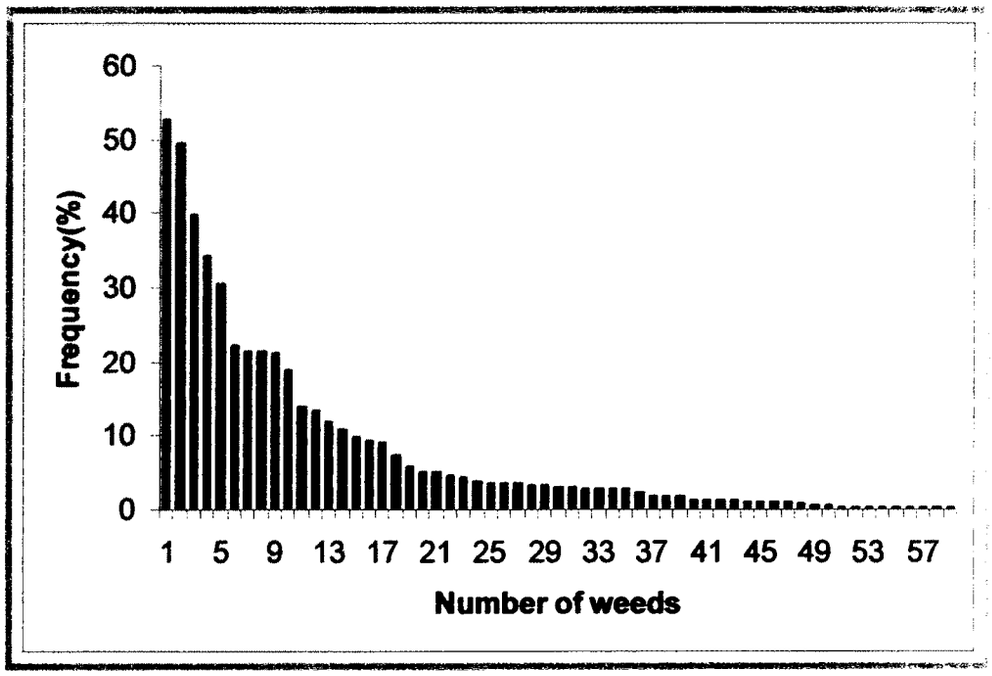
Euphorbiaceae contributed seven species; Amaranthaceae is represented with 6 species while Fabaceae is represented with 4 species. Whereas Convolulaceae and Oxalidaceae are with 3 species each. Families like Lamiaceae, Malvaceae, Rubiaceae contributed by two species and Acanthaceae, Chenopodiaceae, Cucurbitaceae, Gentiniaceae, Linaceae, Lythraceae, Molluginaceae, Nyctaginaceae, Polygalaceae, Portulacaceae, Primulaceae, Scrophulariaceae and Solanaceae contributed one weed species each. (Table -5, Figure-5).

Table 5-: Weed Diversity And Ecological Status Of Kharif Dicot Weed Flora From Satara.

Sr. No.	Name of the weed	Family	D	A	F (%)	F. C.
1	*Ageratum conyzoides* L.	Asteraceae	9.49	17.99	52.78	C
2	*Partheniumhysterophorus* L.	Asteraceae	5..93	12.00	49.4	C
3	*Acalypha indica* L.	Euphorbiaceae	2.46	6.18	39.8	B
4	*Alternanthera sessilis* (L.) R.Br.	Amaranthaceae	2.32	6.76	34.2	B
5	*Mollugo pentaphylla* L.	Molluginaceae	2.48	8.15	30.5	B
6	*Euphorbia rosea* Retz.	Euphorbiaceae	0.68	3.05	22.2	B
7	*Euphorbia geniculata* Orteg.	Euphorbiaceae	1.78	8.28	21.5	B
8	*Euphorbia hirta* L.	Euphorbiaceae	1.01	4.71	21.5	B
9	*Physalis minima* L.	Solanaceae	1.09	5.14	21.2	B
10	*Launaea procumbens* (Roxb) Ramayya & Rajgopal	Asteraceae	1.19	6.29	18.9	B
11	*Phyllanthus amarus* Schum and Thonn.	Euphorbiaceae	0.76	5.53	13.8	A
12	*Tridax procumbens* L.	Asteraceae	0.67	5.0	13.3	A
13	*Eclipta prostrata* (L)L.	Asteraceae	0.52	4.44	11.8	A
14	*Vernonia cinerea* (L) Less.	Asteraceae	0.54	4.94	10.9	A
15	*Portulaca oleracea* L.	Portulacaceae	0.66	6.75	9.77	A
16	*Anagallis arvensis* L.	Primulaceae	0.46	4.93	9.32	A
17	*Neaonitis latifolia* (Dalz.) Deb.and Dutta	Rubiaceae	0.37	4.11	9.02	A
18	*Celosia argentea* L.	Amaranthaceae	0.57	7.73	7.36	A

19	*Amaranthus viridis* L.	Amaranthaceae	0.28	4.71	5.86	A
20	*Melilotus indica* (L.) All.	Fabaceae	0.20	3.90	4.96	A
21	*Leucas ciliata* Benth.	Lamiaceae	0.33	6.66	4.96	A
22	*Argemone mexicana* L.	Asteraceae	0.24	0.01	4.66	A
23	*Chrozophra rootleri* (Geis.) Juss.	Euphorbiaceae	0.09	2.28	4.21	A
24	*Bidens pilosa* L.	Asteraceae	0.15	4.04	3.75	A
25	*Digera muricata* (L.)Mart.	Amaranthaceae	0.13	3.83	3.60	A
26	*Sonchus oleraceous* L.	Asteraceae	0.16	4.5	3.60	A
27	*Biophytum reinwardtii* (Zucc.) Klotz.	Oxalidaceae	0.08	17	3.45	A
28	*Amaranthus spinosus* L.	Amaranthaceae	0.16	4.72	3.30	A
29	*Xanthium indicum* Koen.	Asteraceae	0.09	2.77	3.30	A
30	*Ammania baccifera* L.	Lythraceae	0.25	7.95	3.15	A
31	*Phylocephalum tenue* (Wt.ex.Cl) Narayana	Asteraceae	0.20	6.55	3.00	A
32	*Pentanema indicum* (L.)Ling	Asteraceae	0.24	8.73	2.85	A
33	*Linum mysurense* Heyne	Linaceae	0.09	3.36	2.85	A
34	*Crotalaria hebecarpa* (DC.)Rudd.	Fabaceae	0.11	4.11	2.70	A
35	*Sida acuta* Burm. f.	Malvaceae	0.07	2.61	2.70	A
36	*Galinsoga parviflora* Cav.	Asteraceae	0.19	8.4	2.25	A
37	*Caesulia axallaris* Roxb.	Asteraceae	0.08	4.5	1.80	A
38	*Sopubia delphinifolia*	Scrophulariaceae	0.07	3.75	1.80	A
39	*Lagascea mollis* Cav.	Asteraceae	0.13	8	1.65	A
40	*Amaranthus cruentus*L.	Amaranthaceae	0.04	3.12	1.20	A
41	*Ipomea hederifolia L.*	Convolulaceae	0.02	2	1.20	A
42	*Crotolaria orixensis* Willd.	Fabaceae	0.03	2.62	1.20	A
43	*Spermacoce ocymoides* Burm.f.	Rubiaceae	0.06	5.75	1.20	A
44	Cassia tora L.	Caesalpinaceae	0.03	3	1.05	A
45	*Alysicarpus heyneanus* Wt. & Arn.	Fabaceae	0.04	4.42	1.05	A
46	*Biophytum sensitivum* (L.) DC.	Oxalidaceae	0.03	3.42	1.05	A
47	*Sida rhombifolia* L	Malvaceae	0.03	3.33	0.90	A
48	*Convolvulus arvensis* L	Convolulaceae	0.02	3.6	0.75	A
49	*Rungia elegans* Dalz	Acanthaceae	0.01	2.33	0.45	A
50	*Boerhavia diffusa* L.	Nyctaginaceae	0.01	4.33	0.45	A
51	*Chenopodium album* L.	Chenopodiaceae	0.003	1	0.30	A
52	*Diplocylos palmatus* (L.)Jeffrey	Cucurbitaceae	0.003	1	0.30	A
53	*Exacum pedunculatum* L.	Gentiniaceae	0.03	11	0.30	A
54	*Lavandula bipinnata* (L.) O.Ktze.	Lamiaceae	0.0004	1.5	0.30	A
55	*Blumea lacera*(Burm.F.) DC	Asteraceae	0.0004	3	0.15	A
56	*Argyreia cuneata* Ker	Convolulaceae	0.0002	1	0.15	A
57	*Euphorbia zernoides* Boiss	Euphorbiaceae	0.0001	1	0.15	A
58	*Oxalis corniculata L.*	Oxalidaceae	1.50	1	0.15	A
59	*Polygala erioptera* DC.	Polygalaceae	0.01	7	0.15	A

Figure 5 – Graph Showing Frequency % Of Dicot Weed Species From Kharif Crop Fields Around Satara.



Commelinaceae, Cyperaceae and Poaceae families contributed monocotyledonous weeds. In monocots, sixteen weed species belonging to Cyperaceae and Poaceae were recorded while Commelinaceae represented with two weed species. In monocots, 76% weeds were contributed by Poaceae family. (Table -6, Figure-6).

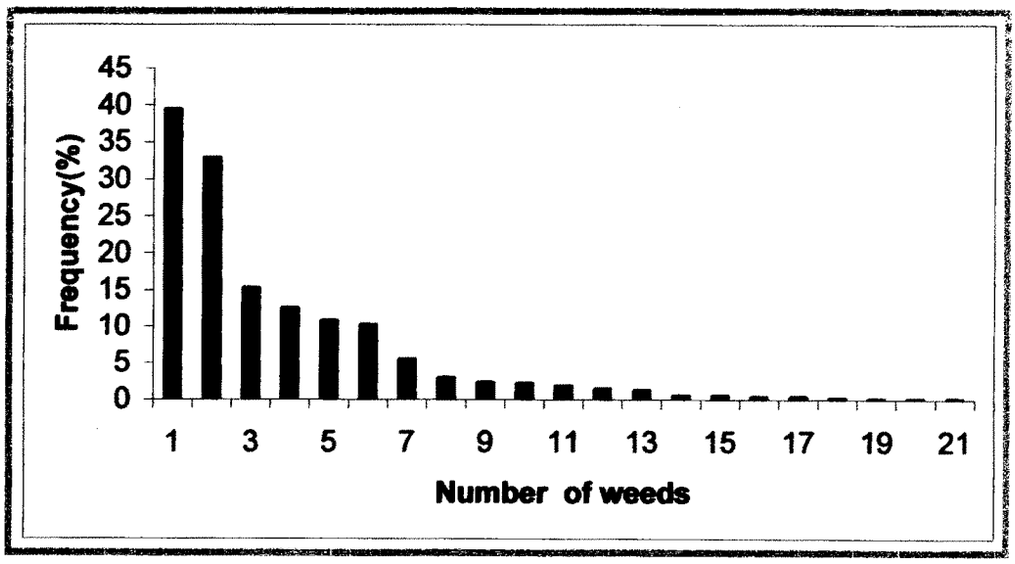
Jain *et al.* (1997), Rothe and Deshmukh (1997), Naik (1998) worked out weeds of kharif crop fields. Jain *et al.* reported nineteen weed species in kharif season, at Research farm of JNKVV, Jabalpur. (M.P.) while Rothe and Deshmukh reported 66 kharif weeds from Akola District. Naik has given a list of 51 weeds from Marathwada region. Singh *et al.* (2000) gave the list of 519 weeds in his flora of Maharashtra.

Present studies found 10, 17 and 24 weed species common with the work of Jain *et al.*, Rothe, Deshmukh and Naik respectively. Weed flora of study area showed 30% simmilarity with the weed flora of Marathwada in kharif season.

Table 6-: Weed Diversity And Ecological Status Of Kharif Monocot Weed Flora From Satara.

Sr No.	Name of the weed	Family	D	A	F	F. C.
1	*Dinebra retroflexa* (Vahl.) panz.	Poaceae	3.89	9.84	39.5	B
2	*Cyperus rotundus* L.	Cyperaceae	5.10	15.49	32.9	B
3	*Arthraxon hispidus* (thunb.) Makino	Poaceae	0.81	5.33	15.3	A
4	*Commelina subfruticosa* Bl.	Commelinaceae	0.38	0.6	12.9	A
5	*Tonningia axallaris* (L.)O.Ktze	Commelinaceae	0.28	2058	10.8	A
6	*Sporobolous indicus* R.Br.	Poaceae	0.53	5.20	10.5	A
7	*Brachiaria eruciformis* (J.E.Sim) Griseb.	Poaceae	0.59	10.56	5.56	A
8	*Cyperus compressus* L.emend Dandy	Cyperaceae	0.36	12.3	3.00	A
9	*Digitaria abludens*(R.&S.)Veldk.	Poaceae	0.05	2.18	2.40	A
10	*Digitaria cilliaris* (Retz) Koel.	Poaceae	0.15	6.53	2.25	A
11	*Commelina forsskalaei* Vahl.	Commelinaceae	0.07	3.84	1.95	A
12	*Dichanthium annulatum* (Forssk) Stapf.	Poaceae	0.24	16.5	1.50	A
13	*Setaria intermedia* (Roth.)R.& S.	Poaceae	0.04	2.55	1.35	A
14	*Cynadon dactylon* (L) Pers	Poaceae	0.025	4.25	0.60	A
15	*Eragrostis Japonica* (Thunb) Trin.	Poaceae	0.02	4	0.60	A
16	*Chloris varigata* Sw.	Poaceae	.0006	4.66	0.45	A
17	*Ischaemum indicum*(houtt.) Merr.	Poaceae	0.01	4.33	0.45	A
18	*Isachne elegans* Dalz.	Poaceae	0.03	13	0.30	A
19	*Echinochloa colona* (L) Link.	Poaceae	.0001	1	0.15	A
20	*Eleusine indica*(L.) Gaertn	Poaceae	0.010	7	0.15	A
21	*Theleopogan elegans* R. & S.	Poaceae	0.0003	2	0.15	A

Figure 6 – Graph Showing Frequency % Of Monocot Weed Species From Kharif Crop Fields Around Satara.



c) Weed Flora Of The Year

Weed flora of study area was composed of hundred and one weed species belonging to twenty-seven families. Forty-four weed species were found season specific of which seventeen weeds occured only in rabi season and twenty seven weeds occured only in kharif season. In the total weed flora,ss number of dicotyledonous and monocotyledonous weeds was 80 and 21 respectively. The proportion of dicotyledonous weeds to monocotyledonous weeds was 3.8:1. Weed contributing families in descending order were Asteraceae (19 genera and 19 species), Poaceae (14 and 16), Fabaceae (7 and 10), Euphorbiaceae (5 and 8), Amaranthaceae (4 and 6), Lamiaceae (4 and 5). (Table -7).

Nineteen families and fifty-six genera of angiospermous weeds were common in both kharif and rabi season. Seventeen weed species of dicotyledonous found only in kharif season, like 1) *Ammania baccifera* (2) *Argyreia cuneata* (3) *Biophytum reinwardtii* (4) *Biophytum sensitivum* (5) *Boerhavia diffusa* 6) *Crotolaria hebecarpa* (7) *Digera muricata* (8) *Diplocylos palmatus* (9) *Galinsoga parviflora* (10) *Ipomea hederifolia* (11) *Lavandula bipinnata* (12) *Linum mysurense* (13) *Melilotus indica,* (14) *Neonitis latifolia* (15) *Polygala erioptera* (16) *Sophubia delphinifolia* (17) *Spermacoce ocymoides.* While following seventeen weed species of dicotyledones recorded only in rabi season, (1) *Corchorus aestuans* (2) *Centaurium meyeri* (3) *Crotalaria filipes* (4) *Desmodium scorpiurus* (5) *Ipomea barleroides* (6) *Indigophera glandulosa* (7) *Indigophera linifolia* (8) *Justicia betonica* (9) *Lathryrus sativus* (10) *Lantana camera* (11) *Leucas aspera* (12) *Orthosiphon pallidus* (13) *Portulaca quadrifida* (14) *Ricinus communis.* (15) *Rungia pectinata* (16) *Salvia plebia* (17) *Stemodia viscosa*

Among monocotyledons *Arthraxon hispidus, Chloris varigata, Commelina subfruticosa, Cyperus compressus, Digitaria abludens, Eleusine indica, Isachne elegans, Ischaemum indicum, Setaria intermedia, Tonningia axillaris* were recorded only in kharif season.

Weed flora of the year 2006-2007 is represented in the table 7. It shows 95 herbs, 3 Shrubs, 2 Climbers, 1 Twiner. The total number of annuals, biannuals and perennials represented in the table are 83,1and 17 respectively.

Paradkar *et al.* (1989) reported 46 weed species of which *Echinochloa sp., Cyperus Sp., Cynadon dactylon and Eclipta alba* were dominant. Singh *et al.* (1992) enumerated most problematic weeds during their survey as *Digeria marginata,*

Galinsoga parviflora, Panicum psilopodium, Elusine indica, Bidens pilosa, Ageratum conyzoides and *Boerria hispida*. Investigation of weed flora conducted by Paradkar *et al.* (1993) comprised 39 species. The most dominant weed species were *Ageratum conyzoides, Amaranthus viridis, Anagalis arvensis, Chenopodiun album, Cynadon dactylon, Cyperus rotundus, Melilotus sp., Sonchus arvensis, Vicia hisuta,* while Singh *et al.* (1993) reported, 123 species during their study. Shoukat *et al.* (1995), Jain *et al.* (1997), Qurehi *et al.* (2001) and Memon *et al.* (2003) reported 165, 33, 50 and 24 weed species respectively, during their crop weed survey. Sit *et al.* (2007) reported, *Ageratum conyzoides, Oxalis corniculata,* and *Vandelia* as dominant weeds. In the present work weed species recorded were more in number as compaired with the work of Paradkar *et al.*, Paradkar *et al.*, Jain *et al.*, Qureshi *et al.* and Memon *et al.* and less in number as compaired with Singh *et al.* and Shoukat *et al.* Singh *et al.* (2000) reported 519 weeds from Maharashtra state while Deshpande (1993) reported 57 weeds from cultivated fields. The present study records hundred and one weeds from study area.

Table 7-: Weed Flora From Satara (2006-2007).

Sr. No.	Name of weed	Family	O	Habit	Life cycle
	DICOT WEEDS				
1	*Rungia elegans* Dalz	Acanthaceae	C	H	A
2	*Rungia pectinata* (L.) Nees	Acanthaceae	R	H	A
3	*Justicia betonica* L.	Acanthaceae	R	H	A
4	*Alternanthera sessilis* (L)RBr.	Amaranthaceae	C	H	B
5	*Amaranthus viridis* L.	Amaranthaceae	C	H	A
6	*Amaranthus spinosus* L.	Amaranthaceae	C	H	A
7	*Celosia argentea* L.	Amaranthaceae	C	H	A
8	*Amaranthus cruentus* L.	Amaranthaceae	C	H	A
9	*Digera muricata* (L.) Mart.	Amaranthaceae	K	H	A
10	*Parthenium hysterophorus* L.	Asteraceae	C	H	A
11	*Ageratum conyzoides* L	Asteraceae	C	H	A
12	*Launaea procumbens* (Roxb) Ramayya & Rajgopal	Asteraceae	C	H	A
13	*Tridax procumbens* L.	Asteraceae	C	H	P
14	*Argemone mexicana* L.	Asteraceae	C	H	A
15	*Lagascea mollis* Cav.	Asteraceae	C	H	A
16	*Sonchus oleraceous* L.	Asteraceae	C	H	A
17	*Blumea lacera* (Burm.F.) DC	Asteraceae	C	H	A
18	*Bidens pilosa* auct non L.	Asteraceae	C	H	A
19	*Phylocephalum tenue* (Wt.ex.Cl) Narayana	Asteraceae	C	H	A
20	*Xanthium indicum* Koen	Asteraceae	C	H	A

21	*Eclipta prostrata* (L) L.	Asteraceae	C	H	A
22	*Pentanema indicum* (L.)Ling	Asteraceae	C	H	P
23	*Caesulia axillaris* Roxb.	Asteraceae	C	H	A
24	*Emilia sonchifolia* (L.) DC.	Asteraceae	C	H	P
25	*Siegesbeckia orientalis* L.	Asteraceae	C	H	A
26	*Spilanthus acmella* auct.non.Murr.	Asteraceae	C	H	A
27	*Synedrella nodiflora* (L.) Gaertn.	Asteraceae	C	H	A
28	*Vernonia cinerea* (L) Less.	Asteraceae	C	H	A
29	*Galinsoga parviflora* Cav	Asteraceae	K	H	A
30	*Cassia tora* L.	Caesalpinaceae	C	H	A
31	*Chenopodium album* L.	Chenopodiaceae	C	H	A
32	*Convolulus arvensis* L	Convolulaceae	C	H	P
33	*Ipomea barleroides* Benth & CL	Convolulaceae	R	Cl	P
34	*Ipomea hederifolia L.*	Convolulaceae	K	T.	A
35	*Argyreia cuneata*	Convolulaceae	K	S	A
36	*Diplocylos palmatus* (L.)Jeffrey	Cucurbitaceae	K	Cl	A
37	*Acalypha indica* L.	Euphorbiaceae	C	H	A
38	*Euphorbia hirta* L.	Euphorbiaceae	C	H	A
39	*Euphorbia rosea* Retz.	Euphorbiaceae	C	H	P
40	*Euphorbia geniculata* Orteg	Euphorbiaceae	C	H	A
41	*Euphorbia zernoides* Boiss	Euphorbiaceae	C	H	A
42	*Chrozophra rootleri* (Geis) Juss	Euphorbiaceae	C	H	A
43	*Phyllanthus amarus* Schumach &Thorn	Euphorbiaceae	C	H	A
44	*Ricinus communis* L.Erand	Euphorbiaceae	R	S	A
45	*Crotalaria orixensis* Willd.	Fabaceae	C	H	P
46	*Alysicarpus heyneanus* Wt & Arn.	Fabaceae	C	H	A
47	*Indigophera glandulosa* Roxb.	Fabaceae	R	H	A
48	*Indigophera linifolia* (L.F) Retz.	Fabaceae	R	H	A
49	*Crotalaria filipes* Benth	Fabaceae	R	H	A
50	*Lathryrus sativus* L.	Fabaceae	R	H	A
51	*Desmodium scorpiurus* (Sw.) Desv	Fabaceae	R	H	A
52	*Melilotus indica*(L.) All	Fabaceae	K	H	A
53	*Crotalaria hebecarpa* (DC.) Rudd.	Fabaceae	K	H	A
54	*Exacum pedunculatum* L.	Gentiniaceae	C	H	A
55	*Centaurium meyeri* (Bunge) Druce	Gentiniaceae	R	H	A
56	*Leucas ciliata* Benth	Lamiaceae	C	S.	P
57	*Leucas aspera* (Willd,) Link	Lamiaceae	R	H	A
58	*Orthosiphon pallidus* Royle	Lamiaceae	R	H	A
59	*Salvia plebia* R.Br.	Lamiaceae	R	H	A
60	*Lanandula bipinnata* (Roth) O.Ktze.	Lamiaceae	K	H	A
61	*Linum mysurense* Heyne	Linaceae	K	H	A
62	*Ammania baccifera* L.	Lythraceae	K	H	A
63	*Sida acuta* Burm f.	Malvaceae	C	H	A
64	*Sida rhombifolia* L.	Malvaceae	C	H	A
65	*Mollugo pentaphylla* L.	Molluginaceae	C	H	A
66	*Boerhavia diffusa* L.	Nyctaginaceae	K	H	P
67	*Oxalis corniculata L.*	Oxalidaceae	C	H	P
68	*Biophytum reinwardtii* (Zucc.) Klotz.	Oxalidaceae	K	H	A

69	*Biophytum sensitivum*(L.) DC.	Oxalidaceae	K	H	A
70	*Portulaca oleracea* L.	Portulacaceae	C	H	A
71	*Portulaca quadrifida* L.	Portulacaceace	R	H	A
72	*Polygala erioptera* DC.	Polygalaceae	K	H	A
73	*Anagallis arvensis* L.	Primulaceae	C	H	A
74	*Neaonitis latifolia* (Dalz.) Deb.& Dutta	Rubiaceae	K	H	A
75	*Spermacoce ocymoides* burm.f.	Rubiaceae	K	H	A
76	*Stemodia viscosa* Roxb.	Scrophulariaceae	R	H	A
77	Sopubia delphinifolia (L.)	Scrophulariaceae	K	H	A
78	*Physalis minima* L.	Solanaceae	C	H	A
79	*Corchorus aestuans* L.	Tiliaceae	R	H	A
80	*Lantana camera* L.	Verbenaceae	R	H	A
MONOCOT WEEDS					
81	*Commelina forsskalaei* Vahl.	Commelinaceae	C	H	A
82	*Commelina subfruticosa* Bl.	Commelinaceae	K	H	A
83	*Tonningia axilaris*(L.)O.Ktze	Commelinaceae	K	H	A
84	*Cyperus rotundus* L.	Cyperaceae	C	H	P
85	*Cyperus compressus* L.emend Dandy	Cyperaceae	K	H	A
86	*Dinebra retroflexa* (Vahl) panz.	Poaceae	C	H	A
87	*Brachiaria eruciformis* (J.E.Sim) Griseb.	Poaceae	C	H	A
88	*Cynadon dactylon* (L) Pers	Poaceae	C	H	P
89	*Dichanthium annulatum* (Forssk) Stapf.	Poaceae	C	H	P
90	*Digitaria cilliaris* (Retz) Koel.	Poaceae	C	H	P
91	*Digitaria abludens*(R.&S.)Veldkamp	Poaceae	K	H	A
92	*Echinochloa colona* (L) Link.	Poaceae	C	H	A
93	*Eleusine indica*(L.) Gaertn	Poaceae	C	H	A
94	*Sporobolous indicus* var.	Poaceae	C	H	P
95	*Theleopogan elegans* Roth	Poaceae	C	H	P
96	*Arthraxon hispidus* (thumb.) Makino	Poaceae	K	H	A
97	*Eragrostis Japonica* (Thunb) Trin.	Poaceae	K	H	A
98	*Chloris varigata* Sw.	Poaceae	K	H	P
99	*Ischaemum indicum*(houtt.) Merr.	Poaceae	K	H	A
100	*Isachne elegans* Dalz.	Poaceae	K	H	A
101	*Setaria intermedia* (Roth.)R.& S.	Poaceae	K	H	A

(A – Annual, B – Biannual, C - Commom in both seasons, Cl - Climber, H – Herb, K - Kharif, O - Occurance, P – Perennial, R - Rabi, S – Shrub, T - Twiner,)

B) Exotic And Endemic Elements Of Weed Flora

a) Exotic Elements - Mahabaleshwar and Panchgani are famous hill stations and tourist spots located in Satara district. Foreigners as well as tourists visit these places from different parts of the country (Deshpande, 1993). As a result, there is a high concentration of exotic species in the local weed flora introduced for food, ornamental and medicinal purposes. A number of weeds also came along with

foodgrains of the imported goods. Many of them are now naturalized in this area. A large number of such weeds (aprox. 150 spp.) are noted to occur in different habitats but the information on their original home, time of introduction, floral biology, genetic systems etc. is not adequate. Exotic weeds are further classified into eleven classes on the basis of their probable centres of origin. (Naik,1998). Analysis of weed flora from study area in this regard showed that they belong to nine classes of exotic group and percentage of exotic element in the weed flora is 30.6 % (31 out of 101). The classes of exotic weeds and weeds representing them from study area are as below.

I) Tropical American: - *Tridax procumbens, Corchorus aestuans, Parthenium hysterophorus*

II) Mexican: - *Argemone mexicana.*

III) Eurasian: - *Anagallis arvensis.*

IV) Afro asian: - *Emilia sonchifolia, Digera muricata.*

V) Austro- Asian: - *Indigophera glandulosa, Salvia plebia.*

VI) Eurasian and African: - *Lathryrus sativus, Sonchus oleraceous.*

VII) Temperate: *Convolulus arvensis.*

VIII) Paleotropical: - *Indigophera linifolia, Commelina forsskalaei.*

IX) Pantropical: - Biophytum sensitivum, *Cassia tora, Vernonia cinerea, Ageratum conyzoides, Eclipta prostrata, Boerhavia diffusa, Celosia argentea, Amaranthus spinosus,* Amaranthus *viridis, Euphorbia hirta, Cyperus compressus.*

X) Cosmopolitan: - *Portulaca oleracea, Oxalis corniculata, Chenopodium album, Cyperus rotundus, Cynadon dactylon, Digitaria cilliaris.*

b) Endemic Elements- Plants growing in restricted areas are termed as Endemic species.Out of 17000 species of flowering plants found in India, nerely 5000 species are said to be endemic to Western Ghats which represent areas of tropical mountain forest is one of the eighteen places on earth termed as hot spots. It harbours nerely 1600 endemic species of higher plants, which found to occur only in Maharashtra, (Singh *et al.* 2000). In the present work one endemic species of family fabaceae was recorded it is *Crotalaria filipes.* It occurs only in rabi season. Ecological parameters like Density, Abundance, Frequency of *Crotalaria filipes* were, 0.003, 1, 0.37% respectively. These values support endemic status of the species.

C) Ecological Studies Of Weed Flora

Quantitative assessment of flora, plant communities and vegetation is done by using ecological methods. In the present work attempt have been made to make quantitative study of weed flora around Satara by using ecological parameters like Density, Frequency and Abundance.

a) Ecological Studies Of Rabi Weeds From Dicot crops –

Quantitative parameters like Density, Abundance and Frequency for weed species in study area ranges between 4.63 to 0.009, 9.21 to 1 and 50.28% to 0.18%. *Parthenium hysterophorus belongs to* Frequency Class 'C' (41 to 60 %), *Euphorbia geniculata, Portulaca oleracea, Euphorbia hirta, Alternanthera sessilis, Brachiaria eruciformis, Cyperus rotundus* comes under Class 'B' (21 to 40%). Remaining 73 weed species are concerned with Class 'A' (1 to 20%). *Brachiaria eruciformis* (9.59), *Cyperus rotundus* (8.92), *Parthenium hysterophorus* (4.63), *Portulaca oleracea* (2.39) and *Euphorbia geniculata* (2.30) are the five dominant weeds according to the Density. According to the Abundance five dominant weeds are *Cyperus rotundus* (34.17), *Brachiaria eruciformis* (26.36) *Echinochloa colona* (18.25), *Eragrostis Japonica* (10.28) and *Dinebra retroflexa* (9.75). Five weeds showing highest Frequency values are *Parthenium hysterophorus* (50.28%), *Euphorbia geniculata* (34.27%), *Portulaca oleracea* (34.08%), *Brachiaria eruciformis* (32.96%)) and *Euphorbia hirta* (28.43%).These five weeds with highest Frequency are recorded from 267,182,181,175 and 181 quadrats respectively and number of individuals of these weeds recorded from study area were 2461, 1222, 1274, 1130, 512 respectively. *Parthenium hysterophorus* is dominant weed according to Frequency while *Cyperus rotundus* and *Brachiaria eruciformis* like weeds become dominant according to Abundance and Density respectively.

b) Ecological Studies Of Kharif Weeds From Dicot Crops

Study reveals that, ecological parameters like Density, Frequency and Abundance for weed species from area under study ranges between 9.49 to 0.0003; 52.78 % to 0.15 % and 17.99 to 0.01 respectively. Analysis of weed vegetation (Raunkiaer, 1934) showed 2 species of Frequency Class 'C' (41 - 60 %), 9 species of Class 'B' (21to 40%) and 69 species of Class 'A' (1 to 20%). Five dominant weeds according to Density are *Ageratum conyzoides* (9.49), *Parthenium hysterophorus* (5.93), *Cyperus rotundus* (5.10), *Dinebra retroflexa* (3.89) *and Mollugo pentaphylla*

(2.48). While according to Abundance weeds are *Ageratum conyzoides* (17.99), *Dichanthium annulatum* (16.5), *Cyperus rotundus* (15.49), *Isachne elegans* (13.00), *Cyperus compressus* (12.3). Depending upon Frequency five dominant weed species are *Ageratum conyzoides* (52.78%), *Parthenium hysterophorus* (49.4%), *Acalypha indica* (39.8%), *Dinebra retroflexa* (39.5%), *Alternanthera sessilis* (34.2%) and these weeds are recorded from 351, 329, 265, 263, and 228 quadrats respectively while number of individuals of these weeds recorded from study area were 6315, 3949, 1648, 2590, 1543 respectively. *Ageratum conyzoides* stands first in all the three parameters.

Information of ecological studies of weeds came through the work of Krishnamurthy (1993), Saraswat (1993), Jain *et al.* (1997), Gupta *et al.* (2003) and Laloo (2004). Jain *et al.* concluded that Vicia *sativa, Phalaris minor, Chenopodium album, Convolulus arvensis, Avena fatua* are the five dominant weeds from JNKVV, Jabalpur M.P. on the basis of Frequency. In the present work five most dominant weeds according to Frequency are *Ageratum conyzoidis*, *Parthenium hysterophorus, Acalypha indica, Dinebra retroflexa* and *Euphorbia geniculata.*

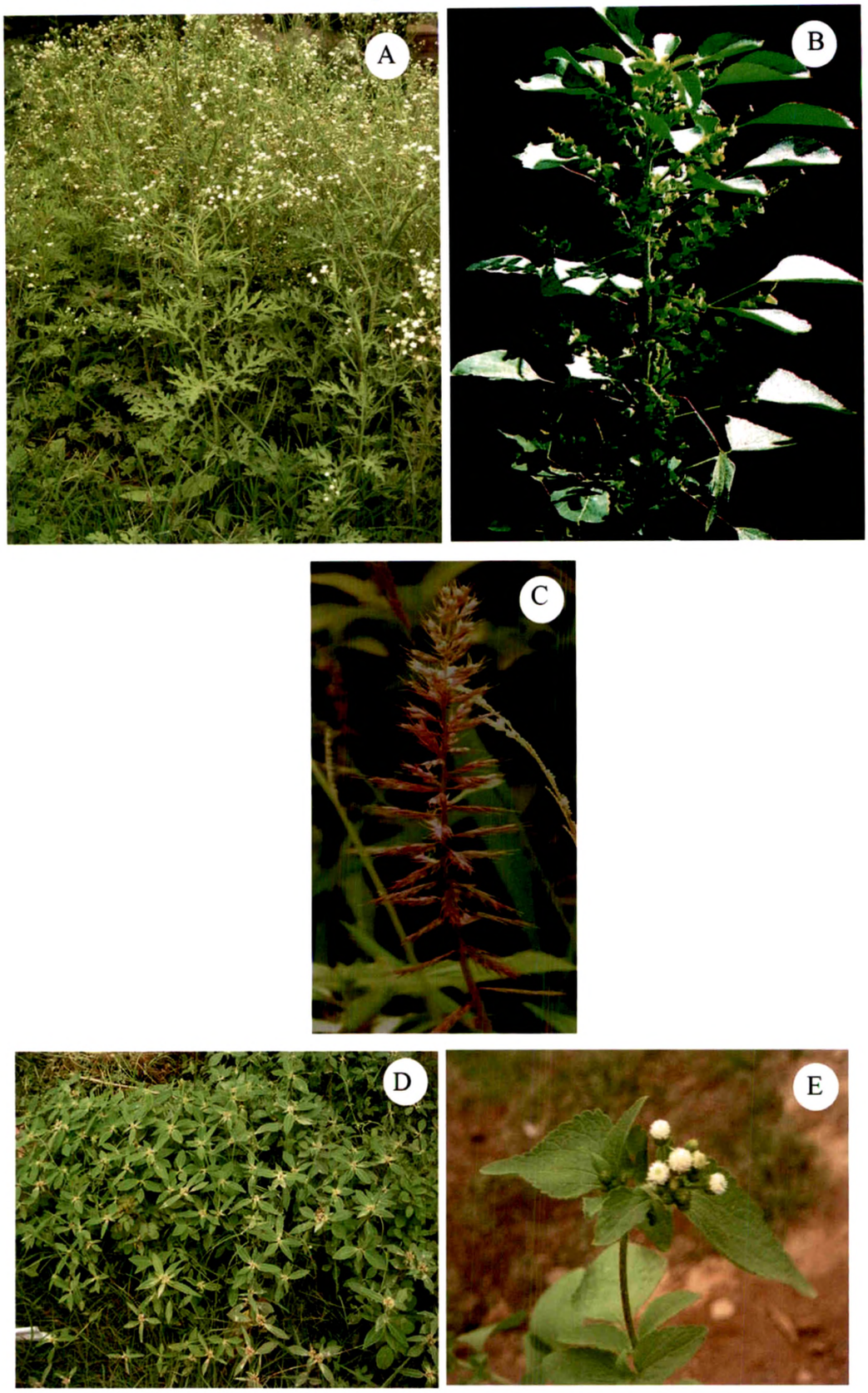
D) Dominant Weeds (Plate I to IV) -

By considering ecological performance of weed species in the vegetation twenty dominant weeds were identified from study area during 2006-07. Frequency percentage was used as a criterion for selecting dominant weed species. Out of twenty weeds fifteen belongs to dicotyledonous and five belongs to monocotyledonous. The proportion of dicotyledonous to monocotyledonous weeds is 3:1. Among dicotyledonous weed species family Asteraceae and Euphorbiaceae contributes five species each; Amaranthaceae is with two species and Portulacaceae, Molluginaceae and Solanaceae are with one species each. Monocot weed species are contributed by poaceae (3 species) and one species each by Cyperaceae and Commelinaceae.

Frequency of dominant weeds ranges from 11.80% to 52.78%. *Ageratum conyzoides* (52.78%) is with highest Frequency followed by *Parthenium hysterophorus* (50.28%) while *Eclipta prostrata* showed lowest Frequency 11.80 %. In monocots *Dinebra retroflexa* of family Poaceae stands at 4 th position in the list with 39.50 % Frequency.While *Commelina subfruticosa* of Commelinaceae stands at 19th position with Frequency 12.90 %. Families represent with single genus such as Portulacaceae, Cyperaceae, Molluginaceae and Solanaceae stands at 7th, 9th,10th, 13th positions in the list of dominant weeds respectively.

PLATE-I

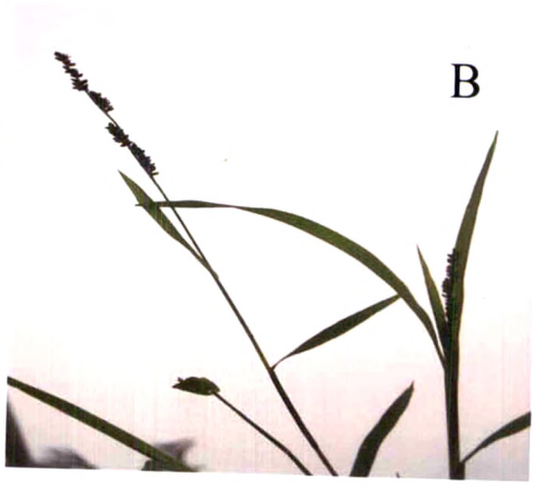
Dominant Weed Species From Study Area



(A)*Parthenium hysterophorus* L. (B) *Acalypha indica* L. (C) *Dinebra retroflexa* (Vahl.) Panz. (D) *Euphorbia geniculata* Orteg. (E) *Ageratum conyzoides* L.

PLATE-II

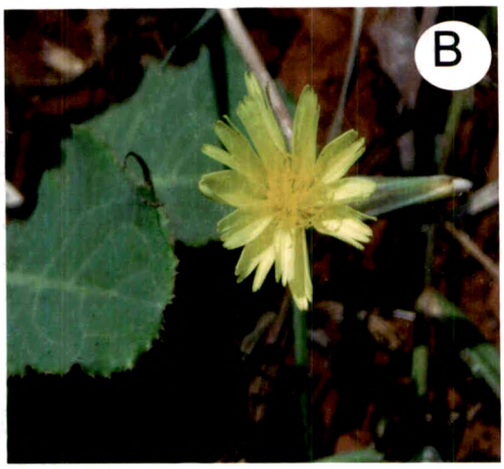
Dominant Weed Species From Study Area



***(A) Portulaca oleracea* L. *(B) Brachiaria eruciformis* (J. E. Sim) Griseb. *(C) Mollugo pentaphylla L.* *(D) Cyperus rotundus* L. *(E) Alternanthera sessilis* (L) R.Br.**

PLATE-III

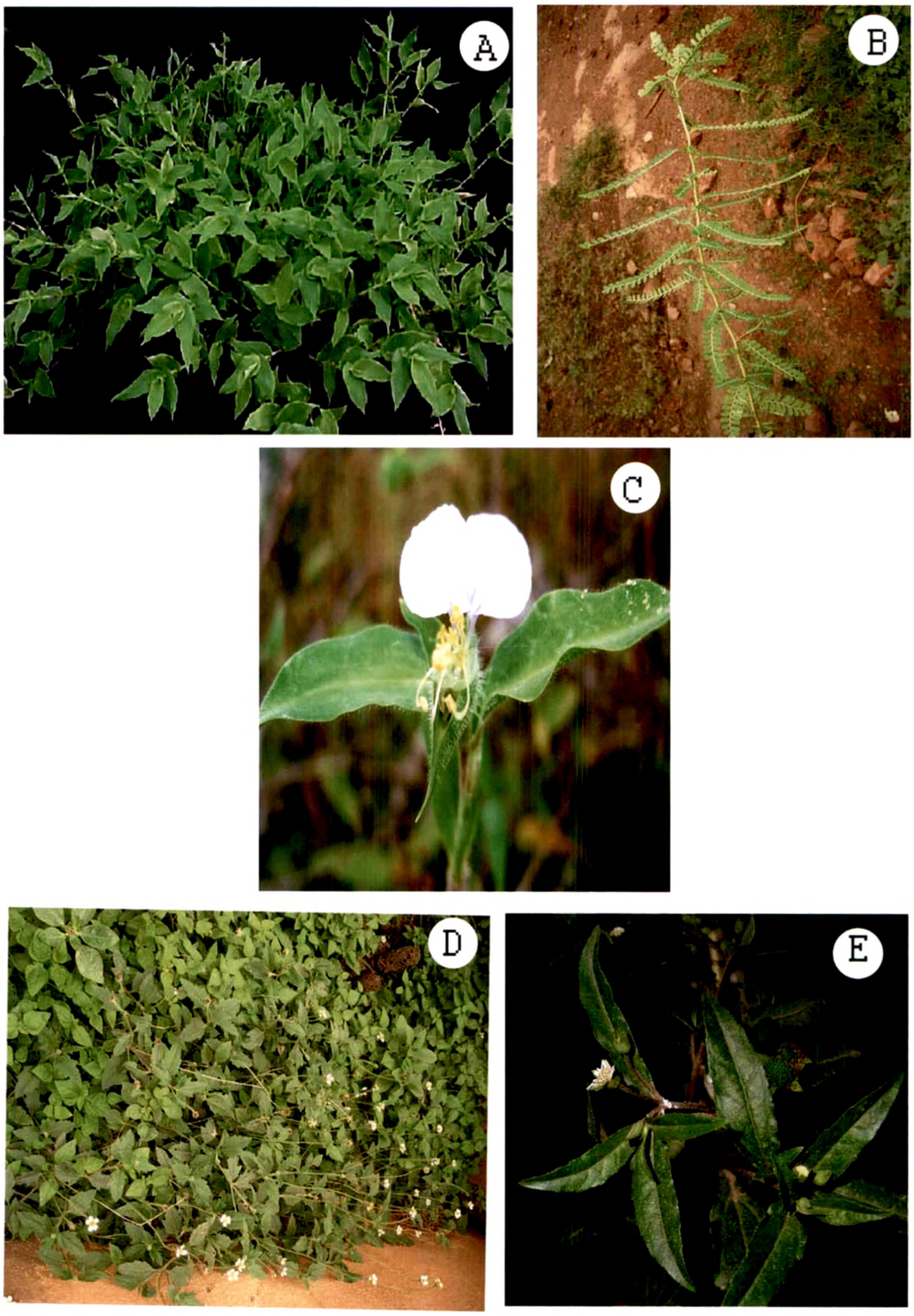
Dominant Weed Species From Study Area



A) Euphorbia hirta L. (B) Launaea procumbens **(Roxb.) Ramayya & Rajgopal (C)** ***Amaranthus Viridis*** **L.** ***(D) Euphorbia rosea*** **Retz.** ***(E)Physalis minima*** **L.**

PLATE-IV

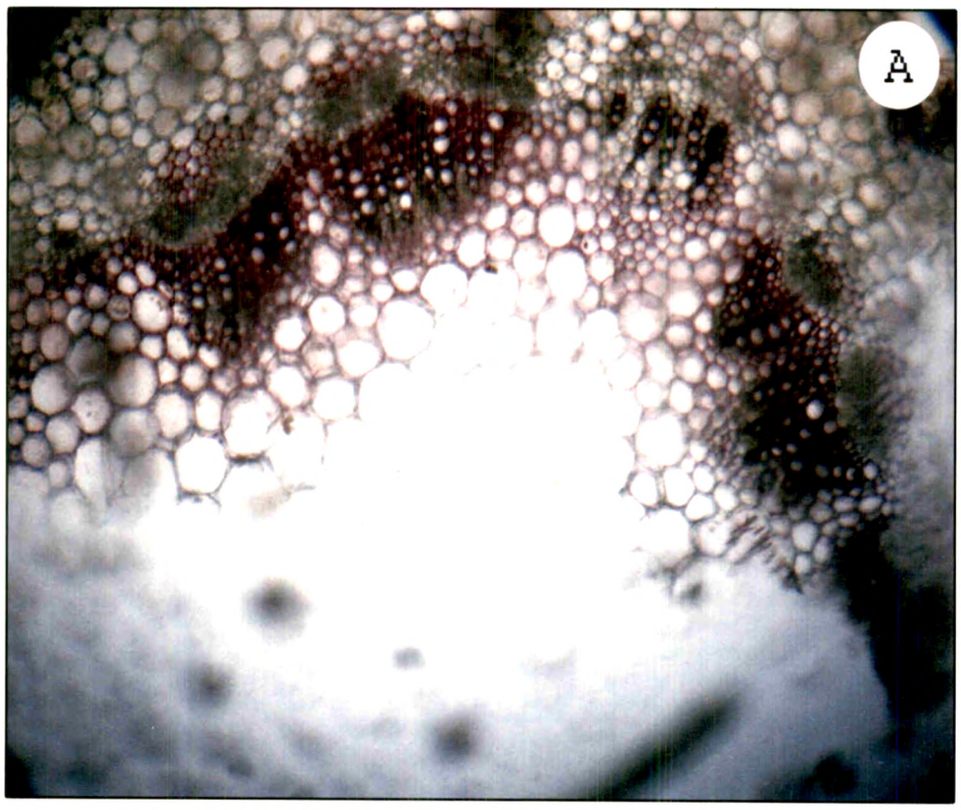
Dominant Weed Species From Study Area

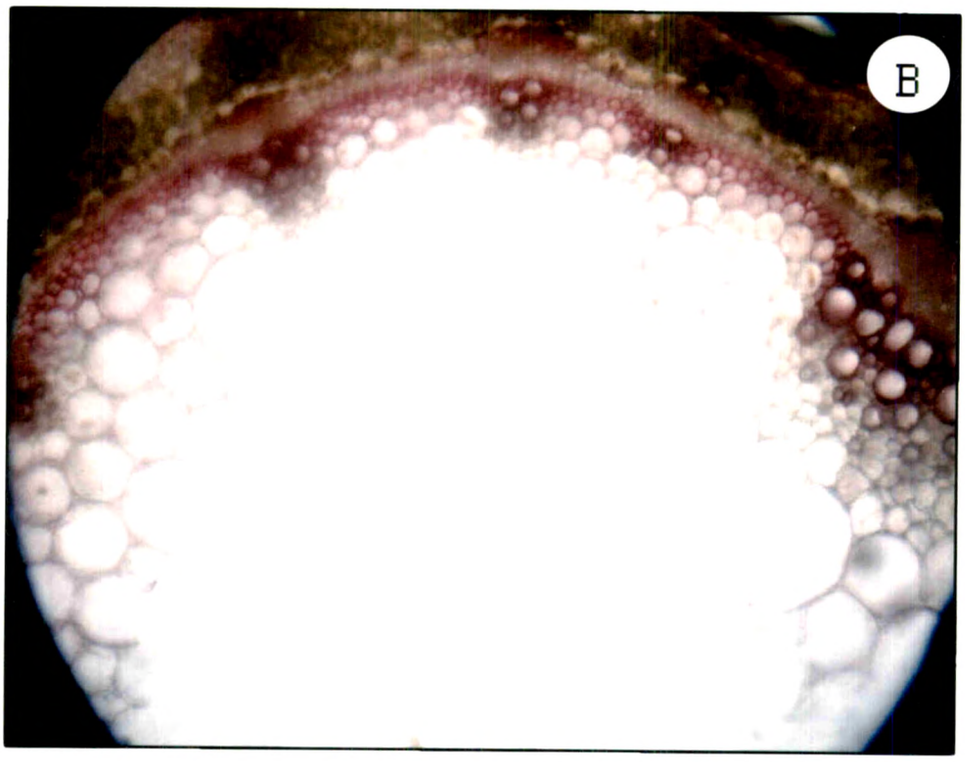


(A)*Arthraxon hispidus* (Thumb.)*Makino* (B)*Phyllanthus amarus* Schumach &Thonn (C) *Commelina subfruticosa* Bl. (D) *Tridax procumbens* L. (E) *Eclipta prostrata* (L.)L.

PLATE-V

Anatomical Studies Of Dominant Weed Species



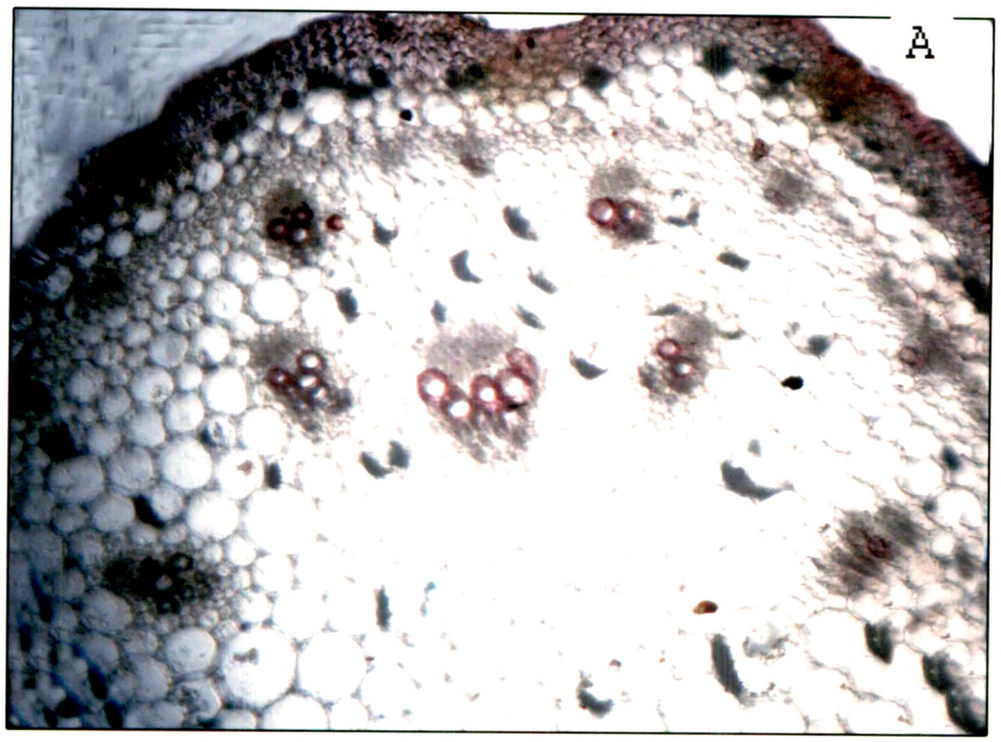


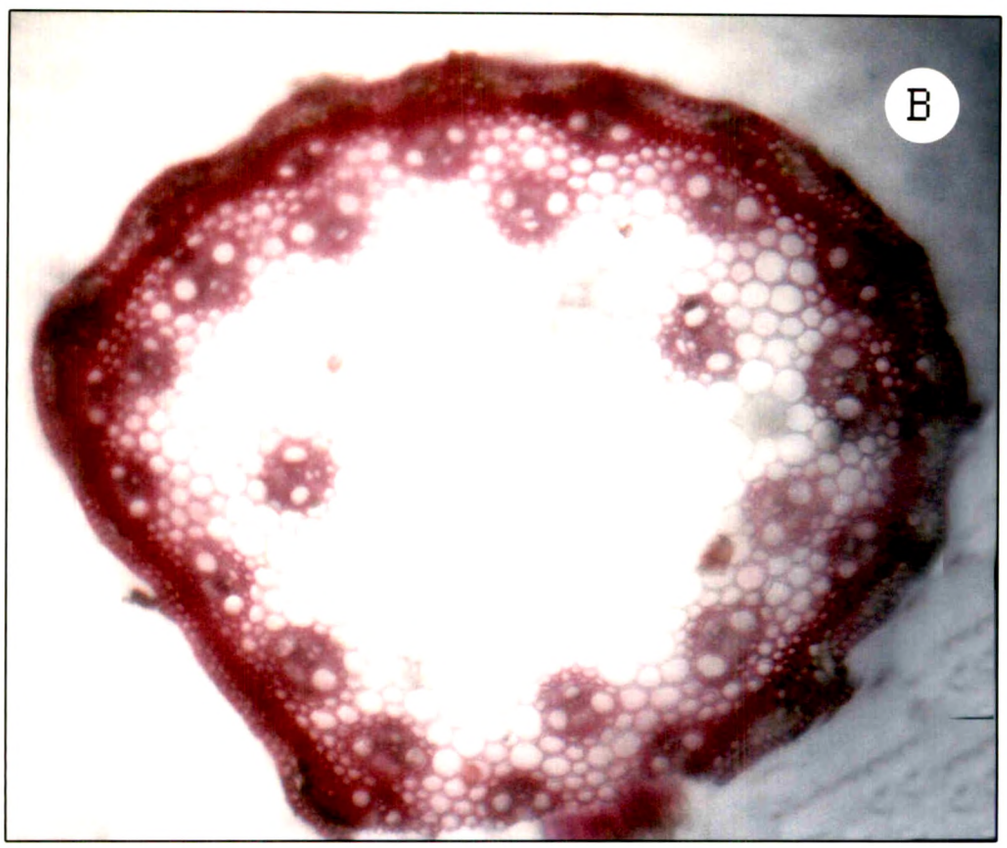
A) Contineous Vascular Bundles in *Ageratum conyzoides* L. Stem (5xX10x).

B) Discontineous Vascular Bundles in *Alternanthera sessilis* (L.) R.Br. Stem (5x X10x).

PLATE-VI

Anatomical Studies Of Dominant Weed Species



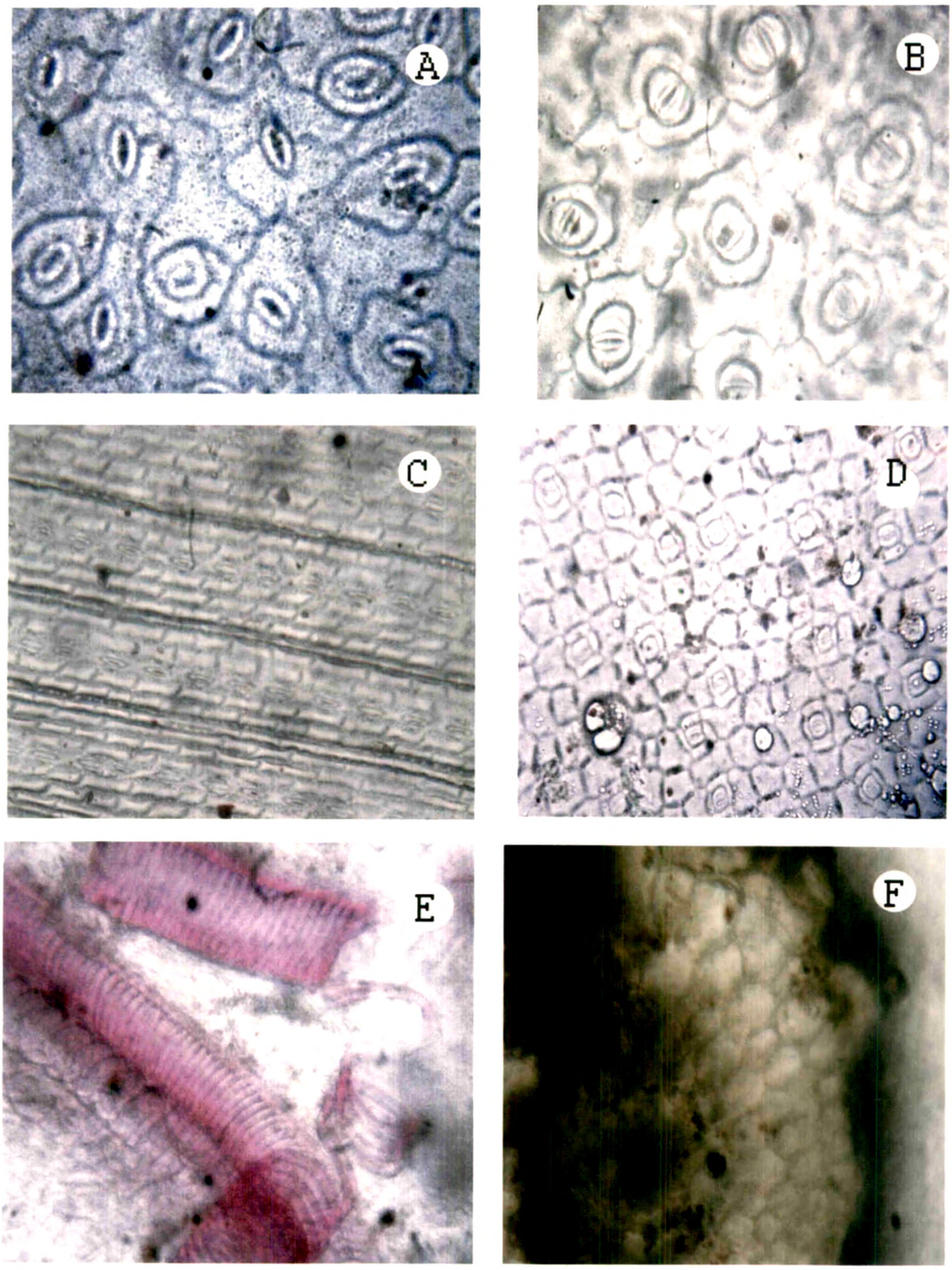


A) Medullary Vascular Bundles in *Amaranthus viridis* (L.) Stem (10x X 10x)

B) Scattered Vascular Bundles In *Brachiaria eruciformis* (J.E.Sim)Griseb. Stem (10x X 10x)

PLATE-VII

Anatomical Studies Of Dominant Weed Species

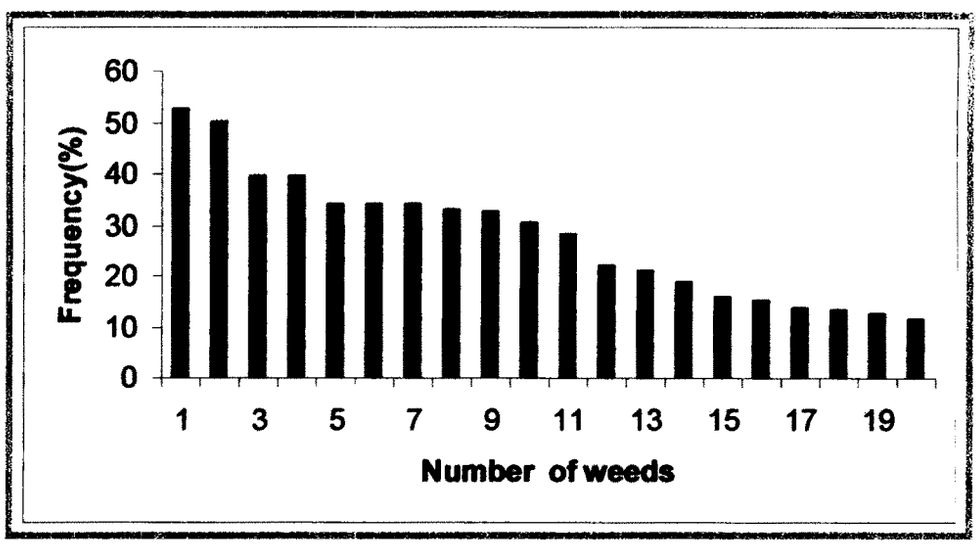


A)Anomocytic Stomata, (15xX10x) (B) Rubiaceous Stomata in *P.oleracea* L. (10xX10x) (C) Graminaceous Stomata (15xX10x) (D) Commelinaceous stomata (15xX45x) (E) Spiral Vessels (10xX45x) (F) Bundle sheath witk C4 pathway in *C.subfruticosa* Bl.(5xX10x)

Table 8 – List Of Twenty Dominant Weeds Around Satara In The Year 2006-07.

Sr. no.	Name of the weed	Family	F (%)
1	*Ageratum conyzoides* L	Asteraceae	52.78
2	*Parthenium hysterophorus* L.	Asteraceae	50.28
3	*Acalypha indica* L.	Euphorbiaceae	39.80
4	*Dinebra retroflexa* (Vahl) panz.	Poaceae	39.50
5	*Euphorbia geniculata* Orteg.	Euphorbiaceae	34.27
6	*Alternanthera sessilis* (L) R.Br.	Amaranthaceae	34.20
7	*Portulaca oleracea* L.	Portulacaceae	34.08
8	*Brachiaria eruciformis* (J.E.Sim) Griseb.	Poaceae	32.96
9	*Cyperus rotundus* L.	Cyperaceae	32.90
10	*Mollugo pentaphylla* L.	Molluginaceae	30.50
11	*Euphorbia hirta* L.	Euphorbiaceae	28.43
12	*Euphorbia rosea* Retz.	Euphorbiaceae	22.20
13	*Physalis minima* L.	Solanaceae	21.20
14	*Launaea procumbens* (Roxb.) Ramayya & Rajgopal	Asteraceae	18.90
15	*Amaranthus viridis* L.	Amaranthaceae	16.00
16	*Arthraxon hispidus* (Thunb.) Makino	Poaceae	15.30
17	*Phyllanthus amarus* Schum and Thonn	Euphorbiaceae	13.80
18	*Tridax procumbens* L.	Asteraceae	13.30
19	*Commelina subfruticosa* Bl.	Commelinaceae	12.90
20	*Eclipta prostrata* (L.) L.	Asteraceae	11.80

Figure 7.-Graph Showing Twenty Dominant Weed Species Around Satara.



E) Morphotaxonomical Studies (Macrocharacters)

Weeds form a group of plants growing in association with cultivated plants in agricultural fields. Weed species belong to different families and genera but they grow under same ecological conditions which are available to crops like soil, nutrients, temperature, light and water. Therefore ecologically they form homogenous ecological group. In the present work attempt have been made to identify certain characters which can be considered as specific to this group. In macrocharacters characters like leaf angle, length of the internode and root is considered. Data regarding this is collected from twenty dominant selected weed species, excluding *Cyperus rotundus*. These weed species show adjustments with microhabitat within the crop field. Crop field can be divided into following three microhabitats. Microhabitats and representative weeds are as below.

I) Weeds growing in field under the standing crop –*Acalypha indica, Ageratum conyzoides, Arthraxon hispidus, Mollugo pentaphylla, Parthenium hysterophorus, Physalis minima, Tridax procumbens.*

II) Weeds growing in open area of the field towards bunds - *Alternanthera sessilis, Brachiaria eruciformis, Dinebra retroflexa, Euphorbia hirta, Euphorbia rosea, Launaea procumbens, Parthenium hysterophorus, Phyllanthus amarus.*

III) Weeds growing around water logging areas of the crop field - *Amaranthus viridis, Commelina subfruticosa, Cyperus rotundus, Eclipta prostrata, Euphorbia geniculata, Portulaca oleracea.*

a) Leaf Angle

Leaf angle in the selected weed species ranges between 23.1^0 to 55.3^0. In category I, II, III average leaf angle is 29.77^0, 38.18^0, and 35.8^0. In category I and III crowding of crop is present and thus angle is relatively less as per available light. In catagory II weed species are growing in more or less open field hence they have larger angles. Photosynthetic efficiency of weeds depends on leaf angle. It is adjustable and changes according to microhabitats and conditions of light.

b) Length Of Internode

In category I, II, III average length of internode is 3.26, 4.13, 4.7cms respectively. In category II weeds are growing in open area and shows less variation in the length of internode. Category III is dominated by succulents and prostrate weed species. This category shows maximum average length of internode.This character of internode length is convenient for quick elongation of stem and for covering the soil

surface in, prostrate weed species. Many weed species reproduce vegetatively by producing roots at nodes. Thus, this character helps in increasing number of weed plants and for successful competition with crop plants.

Table 9 – Microhabitatwise Weeds And Their Macrocharacters

Sr. No.	Mirohabitat	Weeds	Leaf angle ^{0}C	Internode (cm)	Root length (cm)
I)	Weeds growing in field under the standing crop	*Parthenium hysterophorus* L.	33.7 (± 2.9)	4.43 (± 0.68)	5.85 (±1.51)
		Ageratum conyzoides L.	25.2 (±2.52)	8.64 (±0.71)	5.24 (±1.69)
		Acalypha indica L.	33.9 (±3.3)	0.89 (±2.8)	9.57 (±0.4)
		Arthraxon hispidus (Thunb.) Makino.	33.3 (±2.9)	2.00 (±0.61)	12.50 (±4.53)
		Physalis minima L.	23.1 (±3.1)	2.37 (±1.86)	10.28 (±2.57)
		Mollugo pentaphylla L.	24.7 (±2.8)	1.54 (±0.49)	6.60 (±2.48)
		Tridax procumbens L.	34.5 (±2.50)	2.96 (±1.50)	7.80 (±3.88)
II)	Weeds growing in open area of the field toward bund	*Alternanthera sessilis* (L.) R.Br.	55.3 (±3.8)	8.30 (±3.50)	10.25 (±3.12)
		Dinebra retroflexa (Vahl) panz.	45.3 (±2.9)	2.39 (±0.90)	4.60 (±1.18)
		Brachiaria eruciformis (J. E. Sim) Griseb.	28.3 (±1.7)	3.70 (±1.63)	5.58 (±3.21)
		Euphorbia hirta L.	34 (±2.86)	2.89 (±1.20)	7.53 (±2.08)
		Euphorbia rosea Retz.	33 (±2.78)	3.09 (±1.36)	11.20 (±2.91)
		Launaea procumbens (Roxb.) Ramayya & Rajgopal	36.4 (±2.98)	7.49 (±2.18)	8.36 (±.2.5)
		Phyllanthus amarus Schum and Thonn.	35 (±2.8)	1.10 (±0.72)	7.00 (±3.27)

III)	Weeds growing around water logging areas of the crop fields	*Eclipta prostrata* (L.) L.	33.9 (±2.84)	2.62 (±1.04)	11.90 (±5.78)
		Portulaca oleracea L.	29.1 (±2.02)	4.20 (±2.06)	6.72 (±1.28)
		Euphorbia geniculata Orteg.	47.1 (±13.75)	5.75 (±2.41)	11.39 (±2.9)
		Commelina subfruticosa Bl.	35 (±3.1)	8.33 (±7.53)	5.69 (±2.70)
		Amaranthus viridis L.	33.9 (±3.1)	2.60 (±2.29)	11.24 (±2.10)

c) Root Length –Average root length of three categories are 8.26, 7.79 and 9.38 cms. respectively. Weeds form all the three microhabitats show well grown prominent root system. In most of the weed species like, *Ageratum conyzoides, Alternanthera sessilis, Eclipta prostrata, Parthenium hysterophorus* roots are partially perenating organs and they help the plant in passing unfavourable ecological conditions. It is evident from the table that weeds such as *Alternanthera sessilis, Eclipta prostrata, Euphorbia rosea* (prostrate form) which propogate vegetatively, show greater root length and may show their existence throughout the year.

F) Morphotaxonomical Studies (Microcharacters)

Microcharacters studied in dominant weeds were type of stomata and anatomical studies of stem. (Plate V to VII).

a) Type Of Vascular Bundles- Vascular bundles represent association of conducting tissues like xylem and phloem. The general structure of the stem in weeds resemble herbaceous dicotyledones or to that of stem of woody dicotyledones in the first year growth. In dicot weeds, under study following three types of vascular bundles were observed (Chandurkar, 1971).

i) Distinct and discontinuous or separate vascular bundles which are described as typical of herbaceous stem and were found in *Alternanthera sessilis, Eclipta prostrata, Euphorbia geniculata, Launaea procumbens, Parthenium hysterophorus, Physalis minima, Tridax procumbens,*

ii) Vascular tissues in the form of a contineous vascular cylinder were observed in *Ageratum conyzoides, Acalypha indica,, Euphorbia hirta, Euphorbia rosea, Mollugo pentaphylla, Phyllanthus amarus* .

iii) Scattered vascular bundles due to presence of medullary vascular bundles were observed in *Portulaca oleracea and Amaranthus viridis.* These are extremely herbaceous weeds of dicotyledons and show scattered arrangement of vascular bundles like monocotyledons. These vascular bundles are probably without cambium.

Monocot weed species showed scattered vascular bundles. Outer ring of vascular bundles is close to hyphodermis and looking like a young dicotyledonous stem. Number of vascular bundles towards center shows gradual decrease.

Other notable anatomical features observed in weed stems were i) Chlorenchymatous hypodermis which is universal character (ii) Sclernchymatous pericycle or hard bast was observed in weed species like, *Ageratum conyzoides, Euphorbia hirta, Euphorbia rosea, Launaea procumbens, Parthenium hysterophorus, Tridax procumbens.* (iii) Stored material in the form of raphides was observed in the cells of *Ageratum conyzoides* while spheraphides in the cells of *Portulaca oleracea* and *Phyllanthus amarus.* Tannin was observed in the cells of *Amaranthus viridis* (iv) Laticifers were observed in the stem sections of *Euphorbia geniculata, Euphorbia hirta, Euphorbia rosea, Launaea procumbens.* (v) Oil glands present in the cortex of *Cyperus rotundus.* (vi) Hollow pith was observed in the cells of *Euphorbia geniculata.* (vii) Seventy percent of the dominant weed species under study show wavy outline. *Acalypha indica, Arthraxon hispidus, Cyperus rotundus, Dinebra retroflexa, Euphorbia geniculata, Tridax procumbens* showed round outline of the stem in the section. (viii) Spiral thickning in vessels was observed in all weed species under study.

Maheshwari (1929) found in *Rumex crispus* that medullary rays by the same procambial strands producing the normal bundles. According to him medullary bundles are not vestigial organs but they are considered as developed in response to increased need for translocation. Maheshwari (1930) concluded that, medullary bundles found in the stems of centrospermae may represent transition between typical vascular bundles of dicotyledons arranged in a ring and the scattered vascular bundles of monocotyledons.Vascular bundles in weeds are well developed and show transistion from distinct in typical herbaceous dicots to continuous vascular cylinder to scattered arrangement of vascular bundles. Typical scattered bundles of monocot stem resembling dicots in appearance but are structurally different.

Mature vessels are dead cells with secondary walls, which are lignified. The walls are thinner than either trachids or fibres. During development of vessels from

procambium the first formed elements are known as protoxylem they possess annular and spiral thickning. In the beginning of lignification they deposit the ring of lignin (Annular type). Further thickning is in between the rings and connect them forming spiral type of thickning. When the walls further thickned they show reticulate, pitted types. Sclariform thickenings in the walls show the transistion between protoxylem and metaxylem. The main function of vessels is the conduction of water.They also perform mechanical function. In dicotyledons it is clear that, vessels have originated phylogenetically in woody dicots. Weeds are herbaceous and these habits have been evolved from woody or shrubby ancestors (Chandurkar, 1971). It is concluded that, in weeds secondrary growth is not well developed. Also there is a limited function of conduction and mechanical support for vessels. Therefore in weeds lignification becomes less and hence we get only spiral thickning and other types of thickening become rare. Information on morphotaxonomical studies is due to the contribution of Rao and Narmada (1971), Gupta (1992), Ghosh *et al.* (2004). The work is mostly concerned with leaf architecture, leaf anatomy, laticifers, stomatal size and frequency etc. More work is needed in this regard so as to obtain firm conclusions.This will help in making effective use of these characters in weed control and identification.

b) Type Of Stomata - All the dominant dicot weed species under study show ranunculaceous (Anomocytic) type of stomata (except *Portulaca,* it shows rubiaceous stomata). Stomata are surrounded by cells, which are similar to other cells of epidermis. This is most common type of stomata in dicotyledonous weeds. In monocotyledonous weeds types of stomata observed were graminaceous and commelinaceous type. All the weeds under study are amphistomatic except *Cyperus rotundus*, which is hypostomatic. In general, weeds show more stomata on lower surface as compaired to upper surface. Stomatal index of upper epidermis ranges from 4.06 to 78.98 % while for lower epidermis ranges from 12.57 to 73.67 %.(Solereder, 1995).

The dominant weeds under study show same type of stomata (anomocytic type) except *Portulaca* where they are amphistomatic in nature with comparatively more number of stomata towards lower surface. This fact in case of stomata suggests that, weeds may be considered as forming homogenous group. Stomata are made up of guard cells having an opening between them as the stoma. There is respiratory cavity below the stomata, which allows gaseous exchange between the mesophyll and the outside. The guard cells of dicotyledons are kidney shaped. In the monocotyledons

they are elongated and two cells are associated with guard cells known as accessory cells. In many Poaceae and Cyperaceae, guard cells are enlarged at their ends and look like dumb-bels and subsidiary cells are parallel to it. In monocot weeds, four of the five weed species under study, gave Graminaceous type of stomata, except *Cyperus* sp. all are amphistomatic in nature.

Table 10 – Microcharacters Of Dominant Weeds From Satara.

Sr. No.	Name of the weed	Vascular bundles	Thickning	Type of stomata	Stomatal index (%)	
					U.E.	L.E.
1	*Ageratum conyzoides* L	C	Spiral	A.	16.129	48
2	*Parthenium hysterophorus* L.	D	Spiral	A.	21.58	20.36
3	*Acalypha indica* L.	C	Spiral	A	10.15	52.27
4	*Dinebra retroflexa* (Vahl.) Panz.	S	Spiral	A	15.62	34.54
5	*Euphorbia geniculata* Orteg,	D	Spiral	A	8.96	35.4
6	*Alternanthera sessilis* (L.) .R.Br.	D	Spiral	A	78.98	73.67
7	*Portulaca oleracea* L.	D.M.	Spiral	A	30.06	25.89
8	*Brachiaria eruciformis* (J. E. Sim) Griseb.	S	Spiral	A	49.74	46.15
9	*Cyperus rotundus* L.	S	Spiral	H	-	25.99
10	*Mollugo pentaphylla* L.	C	Spiral	A	18.8	14.45
11	*Euphorbia hirta* L.	C	Spiral	A	19.28	15.66
12	*Euphorbia rosea* Retz.	C	Spiral	A	16.59	12.57
13	*Physalis minima* L.	D	Spiral	A	25.40	43.89
14	*Launaea procumbens* (Roxb.) Ramayya & Rajgopal	D	Spiral	A	29.53	38.74
15	*Amaranthus viridis* L.	S	Spiral	A	26.95	35.15
16	*Arthraxon hispidus* (Thub.) Makino	D.M.	Spiral	A	4.06	31.9
17	*Phyllanthus amarus* Schum. and Thonn.	C	Spiral	A	18.75	34.49
18	*Tridax procumbens* L.	D	Spiral	A	26.6	23.08
19	*Commelina subfruticosa* Bl.	D.M.	Spiral	A	19.92	25.92
20	*Eclipta prostrata* (L.)L.	D	Spiral	A	26.10	31.01

(A-Amphistomatic, C-Contineous, D- Discontineous, D.M.-Discontineous Medullary, H-Hypostomatic, L.E. - Lower Epidermis, S –Scattered, U.E.-Upper Epidermis).

c) Kranz Anatomy – Selected dominant weed species were used for studying Kranz anatomical studies of leaf. Out of twenty dominant weeds, five species of family Asteraceae namely *Ageratum conyzoides, Eclipta prostrata, Launaea procumbens, Parthenium hysterophorus, Tridax procumbens* showed C_3 pathway of photosynthesis and remaining fifteen weed species such as, *Acalypha indica, Alternanthera sessilis, Amaranthus viridis, Arthraxon hispidus, Brachiaria eruciformis, Commelina subfruticosa, Cyperus rotundus, Dinebra retroflexa, Euphorbia geniculata, Euphorbia hirta, Euphorbia rosea, Mollugo pentaphylla, Phyllanthus amarus, Physalis minima, Portulaca oleracea* showed C_4 pathway of photosynthesis. 75 % weed species under study showed C_4 Kranz anatomy. Physiological studies in *Parthenium* and succulents were done by Patil (1980) and Kardage (1981) respectively. Foreign workers like Batanouny *et al.* (1991), Ivashchenko (1993), Qasem (1993), and Rowan *et al.* (2007) studied kranz anatomy, C_3 and C_4 photosynthetic pathways in plant species of Euphorbiaceae, Amaranthaceae and other weed families. In the present work, selected dominant weeds from families Amaranthaceae, Commelinaceae, Cyperaceae, Euphorbiaceae, Molluginaceae, Portulacaceae and Solanaceae showed C_4 pathways, while all the species of Asteraceae showed C_3 pathway of photosynthesis.

G) Morohotaxonomical Studies Of Dominant Weeds

Twenty dominant weeds from dicot crop fields in the year 2006-07 were selected on the basis of their values of frequency percentage and are described taxonomically and morphologically which cover following points: habit, nature of stem, occurance, leaves, inflorescence, seed production, seed dispersal, propagation, class, type, English name, local name and family.

1) *Ageratum conyzoides* L. Sp.pl. 839.1753; Hook f. F. Brit.India 3:243. 1881; Cooke, Fl. Pres. Bombay 2:70. 1958 (Repr.); Uniyal in Hajara *et al.* Fl India 12:348. 1995; Shirodkar and Lakshmi, in Singh *et al.* Fl. Maharashtra St. Dicot.2:181, 2001.

Annual, erect, herbaceous, recorded in both seasons, hispid, leaves simple, opposite, crenate, heads in corymbs, white–purple, prolific seed producer (94, 772/plant), seed dispersal by wind and water, seed germinate under wide range of conditions, Pantropical exotic, Bill goat weed, osadi, Asteraceae.

2) *Parthenium hysterophorus* L. Sp. Pl. 988, 1753; S. Kumar in Hajara *et al.* Fl. India 12:403. 1995; Shirodkar and Lakshmi in Singh *et al.* Fl. Maharashtra St. Dicot 2:227, 2001.

Annual, erect, herbaceous, recorded in both seasons, hairy, leaves simple, pinnatified, heads in cymes, white, prolific seed producer (10000 seed/plant), seed dispersal by wind, water, birds, animals, germination after few showers, Tropical American exotic, Congress grass, Gajar gavat, Asteraceae.

3) *Acalypha indica* L. sp. Pl. 1003. 1753; Hook f. Fl. Brit. India 5:416, 1887, Cooke, Fl. Pres. Bombay 3:108. 1958 (Repr.) Londhe in Singh *et al.* Fl. Maharashtra St. Dicot 2:856. 2001.

Annual, erect, herbaceous, recorded in both seasons, stem angular, leaves long petioled, inflorescence axillary spike with foliaceous concave sub-orbicular cuneiform many nerved toothed bracts, seed dispersal by wind and animal. Seed production 10000 / plant, propagation by seed, Alien, Kuppi, Euphorbiaceae.

4) *Dinebra retroflexa* (Vahl.) Panz. in Denkscbr Acad. Wiss Munchen 270, t. 12. 1814; *Cymosurus retroflexus* Vahl; Symb, Bot 2:20 1791; *Dinebra arabica* Jacq. Frag 77; t 121, F 1. 1809; Hook f. Fl. Brit India 7:297, 1896, Blatt & McC Bombay Grass, 264, t. 177, 1935, Bor, Grass, Bur Cey. Ind. Pak 491, 1960, Cook, Fl. Pres. Bombay 3:562 1988(Repr.); Lakshmi in Sharma *et al.* Fl. Maharashtra St. Monocot. 470, 1996.

Annual, culms tufted, herbaceous, recorded in both seasons, leaves linear lanceolate, spikelets in pyramidal, spikes liner, sessile, pale yellow or purple seed, propagation by seeds, dispersal by wind, Alien, Lonigavat, Poaceae.

5) *Euphorbia geniculata* Orteg. Nov. Pl. Hort. Matr. Dec. 18. 1797; Hook f. Fl. Birt. India 5:239. 1887; Cooke, Fl. Pres. Bombay 3:66, 1958 (Repr.); Londhe in Singh *et al.* Fl. Maharashtra St. Dicot 2:880, 2001.

Annual, erect, herbaceous, recorded in both seasons, leaves long, petioled, hairy, cyathia many in dense terminal clustered cymes subtended by a involucral bracts, green, propagation by seeds, dispersal by wind, Alien, Spurge, Dudhani, Euphorbiaceae.

6) *Alternanthera sessilis* (L) R. Br. ex DC. Cat. Hort. Monsp. 4:77. 1813; *Gomphrena sessilis* L. Sp. Pl. 225.1753 *A. triandra* Lam., Encycl. 1:95.1783; Hook. F. Fl.Brit.India 4:731. 1885; Cooke, Fl. Pres. Bombay 2:584. 1958 (Repr.); Lakshmi & Godbole in Singh *et al.* Fl. Maharashtra St. Dicot. 2:783. 2001.

Annual, prostrate, herbaceous, recorded in both seasons, nodes hairy, leaves narrow, linear, oblong, narrow at base, spikes axillary, white, wooly propagation by seed (10000 seeds/plant) and rooting at nodes, seed dispersal by animals, Alien, Khaki weed, Reshimkata, Amaranthaceae.

7) *Portulaca oleracea* L. Sp. Pl. 445 1753; T. Dyer in Hook f. Fl. Brit. India 1:246. 1874; Cooke, Fl. Pres. Bombay 1:72. 1958 (Repr.); Rao in Sharma *et al.* Fl. India 3:4 1993; Shirodkar in Singh *et al.* Fl. Maharashtra St. Dicot 1:261. 2000.

Annual, herbaceous, recorded in both seasons, prostrate, stem succulent, branched, glabrous, reddish, leaves alternate, whorled above, wedge shaped, thick & fleshy, inflorescence axillary, in clusters, supported by whorl of leaves, yellow, prolific seed producer (50000 – 70000 seeds/plant), Dispersal by wind and water, Exotic, Indian Purselane, Ghol, Portulacaceae.

8) *Brachiaria eruciformis* (J. E. Sim.) Griseb in Ledeb. Fl. Ross 4:469. 1853; *Panicum eruciforme* J. E. Sim. in Sibth & J. E. Sm. Fl. Graeca 1:44 t. 59. 1806. *Panicum isachnae* Roth ex. R & S, Syst Veg. 2:458, 1817; Hook f. Fl. Brit Ind. 7:28. 1896; *Brachiaria isachne* Stapf in Fl. Trop. Africa 9:552, 1919;Blatt. & McC. Bombay Grass. 133, t. 85. 1935. Cooke, Fl. Pres. Bombay 3:448. 1958 (Repr.). Bor.Grass Bur. Cey. Ind. Pak. 283. 1960; Lakshmi in Sharma *et al.* Fl. Maharashtra St. Monocot 416, 1996.

Annual, herbaceous, recorded in both seasons, leaves linear acuminate at apex, Inflorescence spikelets arranged in raceme, triquertrous, softly hairy, having solitary spikelets, propagation by seeds and underground stem, dispersal by wind, Alien, Shipi, Poaceae.

9) *Cyperus rotundus* L. sp. Pl. 45. 1753; ssp. *rotundus* Cl in Hook. f. Fl. Brit. India 6:614. 1893; Cooke, Fl. Pres. Bombay 3:385. 1958 (Repr.); Lakshmi in Sharma *et al.* Fl. Maharashtra St. Monocot. 293. 1996.

Perennial, herbaceous, recorded in both seasons, leaves radical, stem bearing tubers on its slender wiry stolon, compound umbels, brown, propagation is mainly by underground stems, seed production is less, cosmopolitan, Exotic weed, Nut grass, Nagarmotha, Cyperaceae.

10) ***Mollugo pentaphylla*** L.Sp.Pl.89.1753; *M. Stricta* sensu Clerke in Hook f. Fl. Brit. India 2:663. 1879 non L.,1762; Cooke, Fl. Pres. Bombay 1:594, 1958 (Repr.). Kamble & Lakshmi in Singh *et al.* Fl. Maharashtra St. Dicot. 2:94. 2001.

Annual, herbaceous, recorded in both seasons, erect, stems numerous, dichotomously branched, leaves obtuse in whorls of 4–9, cyme or pseudoraceme, prolific seed producer, 500000 seeds/plant, Alien, Jharasi, Molluginaceae.

11) ***Euphorbia hirta*** L. sp. Pl. 454. 1753; *E. pilulifera* auct. non. L. 1753; Hook f. Fl. Brit. India 5:250, 1887; Cooke, Fl. Pres. Bombay 3:64, 1958 (Repr.).Londhe in Singh *et al.* Fl. Maharashtra St. Dicot 2:881, 2001.

Annual, prostrate, herbaceous recorded in both seasons, hispid stem with long, yellowish crisped hairs, leaves simple, unequal sided, cyathia many, crowded in small axillary subsessile cymes. It reproduces by seeds (4000 seeds/plant), wind dispersal, Pantropical, Exotic, Garden spurge, Dudhi, Euphorbiaceae.

12) ***Euphorbia rosea*** Retz. obs. Bot 4:26 1786, Hook f. Fl. Brit. India 5: 251, 1887; Cooke, Fl. Pres. Bombay 3:62, 1958 (Repr.), Kulkarni & Thite, J. Shivaji Univ. 17:173, 1977; Londhe in Singh *et al.* Fl. Maharashtra St. Dicot 2:885. 2001.

Perennial, herbaceous, prostrate, recorded in both seasons, leaves opposite with interpetiolar triangular stipules, cyathia axillary or terminal, 1 – 3 in short cymes, propagation by seeds, dispersal by wind and water, Alien, Milk weed, Dudhi, Euphorbiaceae.

13) ***Physalis minima*** L. Sp. Pl. 183. 1753; Cl. in Hook f. Fl. Brit. India 4:238. 1883; Cooke; Fl. Pres. Bombay 2:340, 1958 (Repr.); Madhusudan Rao in Singh *et al.* Fl. Maharashtra St. Dicot. 2:499. 2001.

Annual, herbaceous, recorded in both seasons, leaves long petioled, flowers, solitary, axillary or terminal pale yellow, propagation by yellow seeds, fruits winged (15000 seeds / plant), dispersal by wind, Alien, Mothi popati, Solanaceae.

14) *Launea procumbens* (Roxb.) Ramayya & Rajgopal in Kew Bull. 23(3):465. 1969; *Prenanthes procumbens* Roxb. Fl. Ind 3:404. 1832. *Launea nudicaulis* sensu auct. plur.(India) non. *L. nudicaulis* (L.) Hook f. sensu stricto Fl. Brit India 3:416. 1881; Cooke, Fl. Pres. Bombay 2:122. 1958 (Repr.). Mamgain and Rao in Hajara *et al.* Fl. India 12:309. 1995; Shirodkar and Lakshmi in Singh *et al.* Fl. Maharashtra St. Dicot 2:226. 2001.

Perennial, glabrous, herbaceous, recorded in both seasons, stems naked, leaves sessile, basal rosette with yellow juice, pinnately lobed, margins spinulosely denticulate, heads on short peduncles, solitary or clustered, subracemes, pale yellow, propagation by seeds, wind dispersal, Alien, Patri, Asteraceae.

15) *Amaranthus viridis* L. Sp. Pl. ed. 2:1405, 1763 quoad. Descr. & Herb. L. excl. ref. Baubin & Tourn; Hook f. Fl. Brit. India 4:720. 1885; Cooke, Fl. Pres. Bombay 2:575. 1958 (Repr.); Lakshmi & Godbole in Singh *et al.* Fl. Maharashtra St. Dicot 2:788. 2001.

Annual, herbaceous, recorded in both seasons, erect or diffuse, stem ribbed, leaves opposite, smooth with blunt or shallow notch at rounded tip, margins entire, recemes terminal in axillary cluster, prolific seed producer (10000 or more seeds/plant), dispersal by wind, Pantropical, Exotic, Slender amaranth, Math, Amaranthaceae.

16) *Arthracxon hispidus* (Thunb.) Makino in Bot. Mag. Tokyo 26:214. 1912; *Phalaris hispida* Thunb Fl. Jap. 44. 1784; *Arthraxon ciliaris* Beauv Ess. Agrost. 111,152, t.11, f. 6, 1812. Hook f. Fl. Brit. Ind. 7:145. 1896; Cooke, Fl. Pres. Bombay 3:489. 1908. *A. inermis* Hook f. op. cit. 145, Cooke, op. cit 487; Blatt. & McC., Bombay Grass., 74, t. 45, 1953. Var. **hispidus.** Bor,Grass. Bur. Cey. Ind. Pak. 100. 1960; Lakshmi. in Sharma *et al.* Fl. Maharashtra St. Monocot. 398. 1996.

Annual, herbaceous, recorded in kharif season, culms tufted, leaves ovate, inflorescence raceme, sessile spikelets oblique awned, pedicelled spikelets reduced to a glabrous point, grains linear, terete, reproduction by seeds and stem, dispersal by wind, Alien , Poaceae.

17) ***Phyllanthus amarus*** Schumach and Thonn inn Beskriv.Guin.Pl. 421.1827 et Kongl. *P. niruri* auct.non L.1753; Danske,Vidensk.Selsk, Hook f. Fl. Brit. India 5:298.1887. Cooke, Fl. Pres. Bombay 3:84, 1958 (Repr.), Londhe in Singh *et al.* Fl. Maharashtra St. Dicot 2:898, 2001.

Annual, herbaceous, erect, recorded in both seasons, stem angular, leaves subsessile, elliptic oblong, heads axillary, numerous, very minute, propagation by seeds, dispersal by wind, Alien, Bhuiavali, Euphorbiaceae.

18) ***Tridax procumbens*** L. Sp. Pl. 900:1753; Hook f. Fl. Brit. India 3:311. 1881; Cooke, Fl. Pres. Bombay 2:102. 1958. (Repr); Chowdhery in Hajara *et al.* Fl. India 12:418. 1995; Shirodkar & Lakshmi in Singh *et al.* Fl. Maharashtra St. Dicot 2:247. 2001.

Perennial, herbaceous, recorded in both seasons, leaves in distant pairs, coarsely toothed, both sides hairy, heads radiate, solitary on straight peduncles, hirsute with long spreading hairs, yellow, propagation by seeds (500–1500 seeds/plant), dispersal by wind, Tropical American, Exotic, Coat buttons, Dagadi pala, Asteraceae.

19) ***Commelina subfruticosa*** Bl. Enum. Pl. Jav 1:3, 1827; Hook f. Fl. Brit. India 6:374. 1892; Lakshmi in Sharma *et al.* Fl Maharashtra St. Monocot 161. 1996.

Fleshy, perennial, herbaceous, recorded in both seasons, stems and branches rooting at nodes, leaves sessile, linear oblique at base, inflorescence in spathe, white propagation by seeds and vegetatively by rooting at nodes, dispersal by wind and water, Alien, Kanpet, Commelinaceae.

20) ***Eclipta prostrata*** (L.) L. Mant 2:286. 1771; *Eclipta erecta* L. Mant. 2:286. 1771; *Verbesina prostrata* L. Sp. Pl. 902. 1753, *Eclipta alba* (L.) Hassk. Fl. Jav. Rar. 528. 1848; Hook f. Fl. Brit. India 3:304. 1881, Cooke, Fl. Pres.Bombay 2:95, 1958. (Repr.), Hajara in Hajara *et al.* Fl. India 12:381. 1995; Shirodkar and Lakshmi in Singh *et al.* Fl. Maharashtra St. Dicot. 2:207. 2001.

Annual, erect, herbaceous, recorded in both seasons, often rooting at lower nodes, hispid all over with the hairs rising from a thickened base. Leaves variable, tip acute or acuminate. Heads subglobose, axillary and terminal, propagation by seeds (500 seeds/plant), Pantropical, Exotic, Maka, Astaraceae

H) Key To The Class, Families, Genera And Dominant Weed Species In Dicot Crop Fields Around Satara.

I) Key To The Class And Families

A. Leaves dorsiventral, reticulate, flowers penta or tetramerous, vascular bundles in the stem arranged in a ring, cotyledons two ---------- **Dicotyledonae**

B. Leaves isobilateral, parallel, flowers trimerous, vascular bundles in the stem scattered, cotyledons one ------**Monocotyledonae**

Dicotyledonae

1a.Perianth present, differentiated into calyx and corolla ---------- 2

1a.Perianth present, undifferentiated ----------5

2. Herbs, corolla polypetalous ----------3

2. Herbs, corolla gamopetalous ----------4

3. Flowers in terminal clusters, supported by involucral bract -------- Portulacaceae

3. Stem angular, dichotomous, flowers in terminal cymes or pseudocymes ------Molluginaceae

4. Flower regular, capsule or berry, seeds many ---------- Solanaceae

4. Flower irregular or regular, cypsella, seed one --------- Asteraceae

5. Herbs without latex, bisexual flowers ------ Amaranthaceae

5. Herbs with latex, unisexual flowers ----------Euphorbiaceae

II) Key To The Genera Of Family Asteraceae

1a. Heads exclusively homogamous, ligulate or disciformed ----------2

1b. Heads stalked, heterogamous, radiate or disciformed, outer florets female, inner bisexual ----------3

2a.Florets all ligulate, sap milky, prostrate, Stoloniferous plants with basal rosette of leaves spinescent --*Launea*

2b.Florets all tubular, sap watery, erect, leaf margins Smooth not spinescent ----*Ageratum*

3a.Leaf lamina pinnatified, involucral bracts bi or multiserrate, ray florets white, receptacle convex ----*Parthenium*

3b. Leaves simple, entire or deeply lobed ---------- 4

4. Leaves opposite, involucral bract intact. achenes without basal appendage ---------- Tridax

4. Leaves alternate or subopposite, involucral bracts two seriate, achens winged --------*Eclipta*

III) Key to the genera of family Amaranthaceae

1. Erect herbs, leaves alternate, flowers unisexual, stamens 3 to 5 ovary uniovulate -------- *Amaranthus*

1. Prostrate hairy herbs, leaves opposite, flowers in heads at nodes, bisexual, staminodes present. -------- *Alternanthera*

IV) Key To The Genera Of Family Euphorbiaceae

1. Herbs with milky latex, inflorescence cyathium, flowers Unisexual, both enclosed by common involucres ------- *Euphorbia*

1. Plants erect, transperant without latex, leaves alternate, inflorescence not cyathium, anthers two celled, cells elongate, vermiform, basifixed ------ *Acalypha* indica

1. Plants erect, herbs or shrubs, male flowers with petals, filaments free. ---------- *Phyllanthus amarus*

V) Key To The Genus *Euphorbia*

1. Stem erect, hollow, leaves alternate or opposite, cyathium subtended by leaf like bract -- *Euphorbia geniculata*

1. Stems erect or prostrate, petiole, leaf veins reddish in colour, leaves all opposite, stipulate, glands of involucres with conspicuous petaloid limb -------- *Euphorbia rosea*

1. Erect or prostrate, villous, leaves oblique, Opposite, glands of involucre without a conspicuous petaloid limb -------*Euphorbia hirta*

Monocotyledonae

1. Plants prostrate, leaves ovate, with sheathing base,
   inflorescence cymose, flowers with petaloid perianth ---Commelinaceae
1. Plants erect, leaves linear with sheathing base,
   inflorescence spike or spikelet, fruit one seeded ---------- 2
   2. Plants rhizomatous, aerial stems triangular,
      leaves with closed sheaths fruits nut angular ------- -Cyperaceae
   2. Stem flattened or cylindric, not underground,
      leaves with open sheath, fruit caryopsis ---------Poaceae

VI) Key To The Species Of Family Poaceae

1. Inflorescencce open panicle of racems or spikes,
   pyramidal, spikelets one or many flowered
   distributed along one side of rachis ---------*Dinebra retroflexa*
1. Spikelets two flowered, articulated, with upper
   floret hermaphrodite and lower male or sterile --------2
2. Spikelet often paired, dissimilar or in threes with
   one sessile and one or two pedicelled glumes
   as long as spikelets, upper lemma usually awned,
   lower glumes muriculate or spinulose ------*Arthracxon hispidus*
2. Racemes two to many, scattered on central axis,
   lower glumes well developed spikelets similar,
   solitary glumes membranous upper lemma awnless ----*Brachiaria eruciformis*