

Research Article

AGRESTALS DIVERSITY, USES AND TRADITIONAL KNOWLEDGE FROM VILLAGES ADJOINING VADODARA CITY, GUJARAT

***Shruti Shah¹, Amita Sankhwal² and Deepa Gavali²**

¹B-132/133, Yogenagar township, Nr. Ambika Nagar Cross Road, Gotri, Vadodara

^{2,3}Gujarat Ecology Society, 3rd Floor Synergy house, Subhanpura, Vadodara-390023

**Author for Correspondence*

ABSTRACT

The present paper focuses on the Agrestals diversity and utility of agrestals among two villages Angadh and Fazalpur of Vadodara District of Gujarat. Agrestals are small herbaceous plant within the agricultural fields with impact on crop productivity and agro-ecosystem at large. Agrestals act as valuable component of agro-ecosystem and serve as nutritious food, important source of fodder and health care thereby play an important beneficial role to the common man. The main objective of the study is to understand agrestal diversity, prepare inventory and document traditional knowledge. This paper also describes how agrestal community varies with crop type. From Angadh about 109 species and Fazalpur 118 agrestal species is reported. Agrestal is largely dominated by Poaceae family. In both villages almost 99 % of agrestals are used for different purposes.

Keywords: Agrestal, Crop, Utilization, Traditional Knowledge

INTRODUCTION

The term ‘Agrestal’ was coined by Holzner (1982). ‘Agrestals’ are those plants which are competing with agricultural crops and have short vegetative phase and high reproductive output. Generally, among Agrestals the annuals have a much higher seed production per plant size unit than perennials, the most aggressive perennial agrestals e.g. *Cynodon dactylon*. Of the total annual loss agricultural produce from weeds is 45% in India. The reduction in various crop yield and produce efficiency ranges from 34.3% to 89.8% including wheat (15-30%), rice (30.35%), cotton (44.5%) sugarcane (38.8%) and maize, sorghum, pulses (18-85%) (Gupta, 2003; Aher, 2015). Besides the weed inflict allelopathic effects on crop plants through their root exudates. Some weeds provide alternate host and vector of malaria, dengue fever, yellow fever and other health hazards (Peters, 1955). They reduce human efficiencies by causing hay fever and asthma by pollen (*Parthenium hysterophorus*, *Ambrosia artemisiifolia*), allergenic disorders (*Parthenium hysterophorus*).

On the other hand many agrestals are also the valuable agro-ecosystem component as several species have been used for food, fodder, medicine, fibre and other purposes. In Indian subcontinent farmers consume *Amaranthus*, *Brassica* and *Chenopodium* species as nutritious foods (Dwari and Mondal, 2012; Auti *et al.*, 2004; Hedge, 1994).

In western Rajasthan, yields of sesame and pearl millet can be increased by allowing the crops to grow in association with the leguminous weed *Indigofera cordifolia* (Bhandari & Sen, 1979). Certain weeds limit insect damage to some crops by interfering with pest movement or by providing habitat for natural enemies of pests. Spahillari *et al.*, (1999) re-examined the value of weeds as genetic resources for food agriculture and pharmaceuticals and as indicators of agro-ecosystem biodiversity (Albrecht, 2003; Franke *et al.*, 2009; Sarathambal *et al.*, 2014). There is evidence that weeds may act as a direct host plant for many phytophagous insect species, some of which might be an important food source for farmland birds other desirable wild life species (Sotherton *et al.*, 1985; Marshall *et al.*, 2003; Storkey & Westbury, 2007) and provide habitat, feeding and reproduction sites for natural enemies of pests (Schellhorn & Sork, 1997; Nentwig *et al.*, 1998; Norris & Kogan, 2005). Individual weed species are known to differ in their ecological function in terms of providing resources for beneficial invertebrates and seed eating birds (Hawes *et al.*, 2003; Storkey, 2006) as well as in their impediment to crop production (Hassan & Marrwat, 2001; Boatman *et al.*, 2003).

Research Article

The present study deals with the study of agrestal diversity among agricultural fields of Angadh and Fazalpur villages of Vadodara district which are 70 % urbanized. In context to the traditional uses of agrestals very few studies is carried out in Gujarat. Among them very few studies (Phatak & Oza, 1958; Bhattacharyya, 1996; Sankhwal *et al.*, 2013 & 2015) provided information on some medico-ethno-botanical value of weeds of Baroda, its neighbourhood, Pavagarh and Saurashtra.

The present study was conducted to explore and identify the agrestal diversity of irrigated and non irrigated agricultural fields and documenting their traditional utilization and crop-weed association for major crops of the villages.

Study Area

The villages Angadh and Fazalpur are situated on the bank of Mahisagar River. The average annual rainfall in the area is around 1000 mm. The maximum temperature during summers reached around 40°C and minimum temperature during winters is 12 °C. The terrain is undulating and soil is Coarse Loamy mix and Fine Loamy mix. Agriculture occupies the major important land use of the villages. In case of Angadh village, out of total area of 1136 ha, 643 ha is allocated for agriculture, while at Fazalpur 374 Ha is under agriculture out of total area of 613 ha (source: village panchayat records). Major crops include wheat, cotton, millet, tobacco, vegetables, fodder crops and fruit crops (Figure 1).

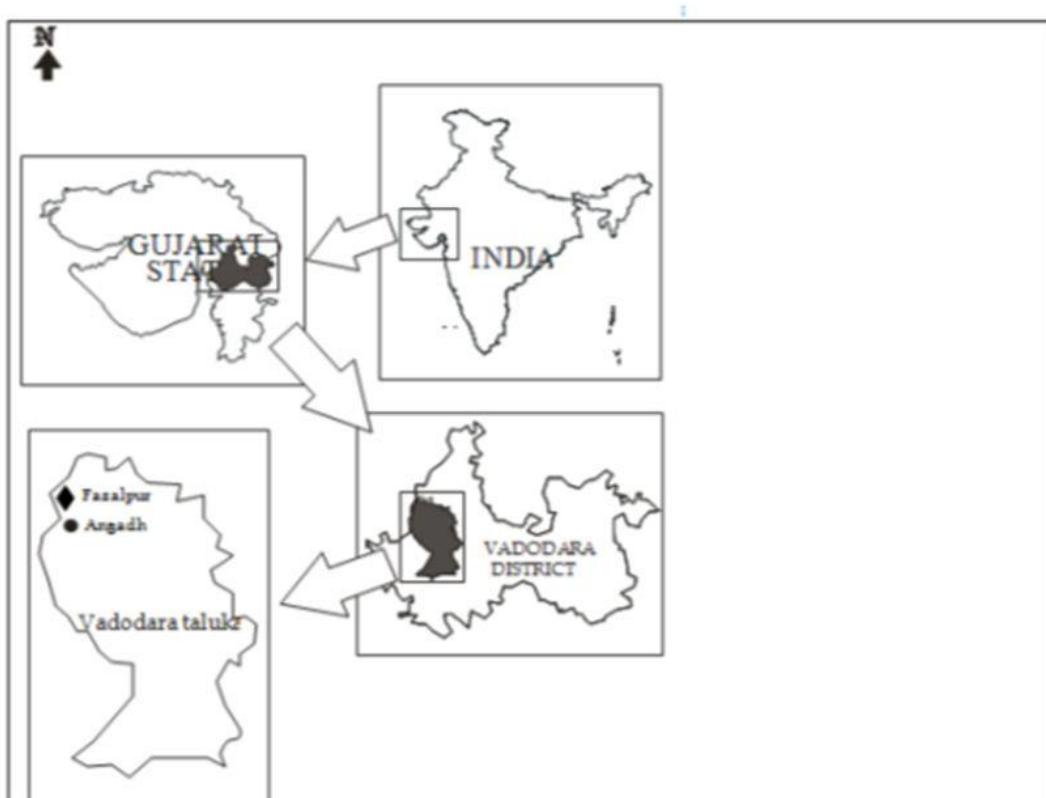


Figure 1: Location Map: Angadh and Fazalpur Village, Vadodara

MATERIALS AND METHODS

The present study was undertaken in different seasons during 2012-1014. All the agrestals species from different agricultural fields include Pearl millet, Wheat, Tobacco, Cotton, vegetable crops, fodder crops etc was recorded. The phenology of the species was noted down. Plant specimens collected in both vegetative and reproductive stages from different crop fields for morphological study and identification purpose. The collected specimens identified with the help of floras (Hooker, 1961; Cooke, 1967; Shah, 1978; Singh & Karthikeyan, 2000; Sharma *et al.*, 2001) and other reference material. Photographic

Research Article

records were done. They were collected at flowering stages and herbarium specimens were prepared as vouchers using standard techniques (Jain & Rao, 1967). All the collected plant specimens and prepared voucher specimens kept in the Gujarat Ecology Society Herbarium. For the current name and up to date nomenclature web site ‘the plant list’ were also consulted (The Plant List, 2013). Questionnaire based survey was done with the locals to know the local names and traditional use of the agrestals.

RESULTS AND DISCUSSION

Enumeration of species with their botanical name, local and English name are presented in Table 2. In the present study total 119 herbaceous species were identified as agrestals belonging to 87 genera and 34 families from agricultural fields in the two villages. At Angadh village 109 agrestals species representing 32 families and at Fazalpur village represented 118 agrestals species under 34 families is reported (Table 2, Table 3). Representation of dicotyledons agrestal species dominated with 72.26 % (86 species) while 27.73 % (33 species) represented Monocotyledons.

Family wise agrestal species is listed in Table 3. The top 7 families with more than 5 species are Amaranthaceae (9sp.), Asteraceae (9), Cyperaceae (6), Euphorbiaceae (6), Fabaceae (10), Malvaceae (6), Poaceae (23) from Angadh village. Whereas, in Fazalpur village top 8 families with 5 or more than 5 species are Acanthaceae (6), Amaranthaceae (9), Asteraceae (9), Cyperaceae (6), Euphorbiaceae (5), Fabaceae (10), Malvaceae (6), Poaceae (25). Habit wise herbs dominated and only under shrub reported is *Abutilon indicum* (L.) Sw. (Syn. *Sida indica* L.).

Monocotyledon is represented by Cyperaceae, Commelinaceae and Poaceae. Poaceae was the largest family represented 21 % and 22 % of total agrestals with 23 and 25 species in Angadh and Fazalpur respectively.

The dominant genera in agrestal were *Cyperus* (6), *Eragrostis* (5), *Sida* (4), *Corchorus* (3). In irrigated crops, *Cynodon dactylon* (L.) Pers., *Cyperus rotundus* L. subsp. *rotundus*, *Dactyloctenium aegyptium* (L.) P. Beauv., *Echinochloa colonum* (L.) Link. *Parthenium hysterophorus* L., *Portulaca oleracea* L., *Tridax procumbens* L. are predominant agrestal reported. In non-irrigated crop fields, *Cynodon dactylon* (L.) Pers., *Dactyloctenium aegyptium* (L.) P. Beauv., *Tridax procumbens* L., *Bergia suffruticosa* (Del.) Fenzl., *Glinus lotoides* L. (Syn. *Mollugo hirta* Thunb.), *Heliotropium supinum* L., *Indigofera linnaei* Ali (Syn. *Indigofera enneaphylla* L.), *Parthenium hysterophorus* L., *Solanum surattense* Burm. F is common.

Presence of *Chamaecrista absus* (L.) H.S.Irwin & Barneby, *Senna occidentalis* (L.) Link, *Senna tora* (L.) Roxb. species indicate high level of anthropogenic pressure in agricultural fields.

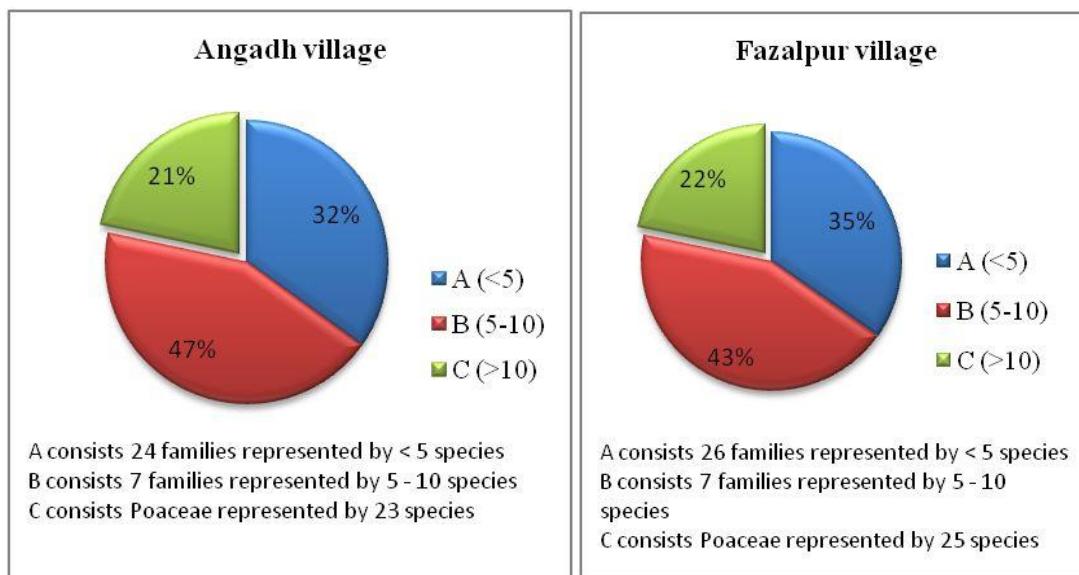


Figure 2: Family wise Distribution

Research Article

Table 2: Inventory of Agrestals from Study Area

Sr. No.	Scientific Name	Family	Local Name	Angadh	Fazalpur
1.	<i>Abutilon indicum</i> (L.) Sw. (Syn. <i>Sida indica</i> L.)	Malvaceae	Fundi, Khapat	✓	✓
2.	<i>Acalypha indica</i> L.	Euphorbiaceae	Dadro	✓	✓
3.	<i>Acrachne racemosa</i> (Heyne ex R. & S.) Obwi (Syn. <i>Eleusine racemosa</i> Heyne ex R. & S.)	Poaceae	Chinkhe	✓	✓
4.	<i>Achyranthes aspera</i> L.	Amaranthaceae	Anghedi	✓	✓
5.	<i>Aerva lanata</i> (L.) Juss.	Amaranthaceae	Gorakh ganjo	✓	✓
6.	<i>Aerva javanica</i> (Burm. f.) Juss. ex J. A. Schultes	Amaranthaceae	Gorakh ganjo	✓	✓
7.	<i>Ageratum conyzoides</i> L.	Asteraceae	Mankad mari, Dholi sadadi	✓	✓
8.	<i>Alternanthera pungens</i> H. B. & K. Nov.	Amaranthaceae		✓	✓
9.	<i>Alternanthera sessilis</i> (L.) DC.	Amaranthaceae		✓	✓
10.	<i>Alysicarpus procumbens</i> (Roxb.) Schindl.	Fabaceae		✓	✓
11.	<i>Alysicarpus scariosus</i> (Rottl. Ex Spreng.) Grah. Ex Thw.	Fabaceae	Ruchhalo samervo	✓	✓
12.	<i>Amaranthus spinosus</i> L.	Amaranthaceae		✓	✓
13.	<i>Amaranthus viridis</i> L.	Amaranthaceae		✓	✓
14.	<i>Anagallis arvensis</i> L.	Primulaceae	Pimperbel	✓	✓
15.	<i>Apluda mutica</i> L.	Poaceae	Mauritian grass	✓	✓
16.	<i>Arundinella metzii</i> Hochst. Ex Miq.	Poaceae	Dhudu Ghas, Bajariu	✓	✓
17.	<i>Arundinella pumila</i> (Hochst.) Steud.	Poaceae		✓	✓
18.	<i>Avena sterilis</i> L. var. <i>culta</i> (Syn. <i>Avena sativa</i> auct. ron L.):	Poaceae	Jangali Oat	✓	✓
19.	<i>Barleria prionitis</i> L.	Acanthaceae	Kantasherio	✓	✓
20.	<i>Bergia suffruticosa</i> (Del.) Fenzl.	Elatinaceae	Gandharo Okhrad	✓	✓
21.	<i>Blepharis maderaspatensis</i> (L.) Roth	Acanthaceae	Untigan	✓	✓
22.	<i>Blumea eriantha</i> DC.	Asteraceae		✓	✓

Research Article

23.	<i>Blumea lacera</i> (Burm. F.) DC.	Asteraceae	✓	✓
24.	<i>Boerhavia chinensis</i> (L.) Druce	Nyctaginaceae	✓	✓
25.	<i>Boerhavia diffusa</i> L.	Nyctaginaceae	Punarnava, Satodi	✓
26.	<i>Chamaecrista absus</i> (L.) H.S.Irwin & Barneby (Syn. <i>Cassia absus</i> L.)	Caesalpiniaceae	Chimed	✓
27.	<i>Catharanthus roseus</i> (L.) G. Don	Apocynaceae	Barmasi	✓
28.	<i>Celosia argentea</i> L.	Amaranthaceae	Lampdi	✓
29.	<i>Cenchrus biflorus</i> Roxb.	Poaceae		✓
30.	<i>Chenopodium album</i> L.	Chenopodiaceae	Chil ni bhaji	✓
31.	<i>Chenopodium murale</i> L.	Chenopodiaceae	Balaro	✓
32.	<i>Chloris barbata</i> Sw.	Poaceae	Kadiyu	✓
33.	<i>Cleome gynandra</i> L. (Syn. <i>C. pentaphylla</i> L.)	Capparaceae	Gandhatu	✓
34.	<i>Clitoria ternatea</i> L.	Fabaceae	Aparajita, Koyal, Garni	✓
35.	<i>Cocculus hirsutus</i> (L.) Diels	Menispermaceae	Vevti, Vevdi	✓
36.	<i>Commelina benghalensis</i> L.	Commelinaceae		✓
37.	<i>Commelina diffusa</i> Burm. f.	Commelinaceae		✓
38.	<i>Convolvulus microphyllus</i> (Roth.) Sieb. Ex Spr.	Convolvulaceae	Shankhavali, Dholi Shankhavali	✓
39.	<i>Corchorus aestuans</i> L.	Tiliaceae	Chunch	✓
40.	<i>Corchorus fascicularis</i> L	Tiliaceae	Chunch	✓
41.	<i>Corchorus tridens</i> L.	Tiliaceae	Chunch	✓
42.	<i>Chrozophora prostrata</i> Dalz.	Euphorbiaceae		✓
43.	<i>Crotalaria medicaginea</i> Lam.	Fabaceae		✓
44.	<i>Cynodon dactylon</i> (L.) Pers.	Poaceae	Durva, Darbh	✓
45.	<i>Cyperus alulatus</i> Kern	Cyperaceae		✓
46.	<i>Cyperus bulbosus</i> Vahl	Cyperaceae		✓

Research Article

47.	<i>Cyperus compressus</i> L.	Cyperaceae		✓	✓
48.	<i>Cyperus esculentus</i> L.	Cyperaceae		✓	✓
49.	<i>Cyperus iria</i> L.	Cyperaceae		✓	✓
50.	<i>Cyperus rotundus</i> L. subsp. <i>rotundus</i>	Cyperaceae	Dhupel	✓	✓
51.	<i>Dactyloctenium aegyptium</i> (L.) P. Beauv.	Poaceae		✓	✓
52.	<i>Desmodium gangeticum</i> (L.) DC. var <i>gangeticum</i>	Fabaceae	Shalparni	✓	✓
53.	<i>Dichanthium annulatum</i> (Forsk.) Stapf	Poaceae	Zinjavo	✓	✓
54.	<i>Digera muricata</i> (L.) Mart.	Amaranthaceae	Kanjaro	✓	✓
55.	<i>Digitaria adscendens</i> (H. B. & K.) Henrard (Syn. <i>D. sanguinalis</i> Scop. var. <i>ciliaris</i>)	Poaceae	Aarotaro	✓	✓
56.	<i>Dinebra retroflexa</i> (Vahl) Panz.	Poaceae	Khariu	✓	✓
57.	<i>Echinochloa colonum</i> (L.) Link	Poaceae	Samo	✓	✓
58.	<i>Echinochloa frumentacea</i> Link	Poaceae	Banti	✓	✓
59.	<i>Eclipta prostrata</i> (L.) L. Mant. (Syn. <i>Eclipta alba</i> (L.) Hassk.)	Asteraceae	Bhangro	✓	✓
60.	<i>Eleusine coracana</i> (L.) Gaertn,	Poaceae	Bavto	✓	✓
61.	<i>Eleusine indica</i> (L.) Gertn.	Poaceae	Ukdo	✓	✓
62.	<i>Enicostema axillare</i> subsp. <i>littorale</i> (Blume) A.Raynal	Gentianaceae	Mamejvo, Kadvi nai	✓	✓
63.	<i>Eragrostis ciliaris</i> (L.) R. Br.	Poaceae	Murmur	✓	✓
64.	<i>Eragrostis japonica</i> (Thunb.) Trin.	Poaceae		✓	✓
65.	<i>Eragrostis poaeoides</i> P. Beauv.	Poaceae	Darudi	✓	✓
66.	<i>Eragrostis tenella</i> (L.) P. Beauv. ex R. & S.	Poaceae	Kalavo	✓	✓
67.	<i>Eragrostis unioloides</i> (Retz.) Nees	Poaceae		✓	✓
68.	<i>Euphorbia hirta</i> L.	Euphorbiaceae	Bhony dudhe li	✓	✓
69.	<i>Euphorbia prostrata</i> Ait.	Euphorbiaceae	Bhony dudhe li	✓	✓
70.	<i>Evolvulus alsinoides</i> (L.) L.	Convolvulaceae	Kali Shankhavali	✓	✓
71.	<i>Evolvulus nummularius</i> (L.) L.	Convolvulaceae	Dholi Shankhavali	✓	✓

Research Article

72.	<i>Glinus lotoides</i> L. (Syn. <i>Mollugo hirta</i> Thunb.)	Molluginaceae	Mitho okharad	✓	✓
73.	<i>Heliotropium supinum</i> L.	Boraginaceae	Ghedio okhrad	✓	✓
74.	<i>Hybanthus linearifolius</i> (Vahl) Urb. (Syn. <i>Ionidium suffruticosum</i> Ging.)	Violaceae		✓	✓
75.	<i>Hygrophila serpyllum</i> (Nees) T. Anders.	Acanthaceae	Sarpat	✓	✓
76.	<i>Indigofera linnaei</i> Ali (Syn. <i>Indigofera enneaphylla</i> L.)	Fabaceae	Fatakiya	✓	✓
77.	<i>Justicia simplex</i> D. Don.	Acanthaceae		✓	✓
78.	<i>Launaea procumbens</i> (Roxb.) Ramayya & Rajagopal	Asteraceae	Moti Bhonpatri	✓	✓
79.	<i>Leucas aspera</i> (Willd.) Spr.	Lamiaceae	Kubi	✓	✓
80.	<i>Leucas cephalotes</i> L.	Lamiaceae	Kubo	✓	✓
81.	<i>Malvastrum coromandelianum</i> (L.) Garcke	Malvaceae		✓	✓
82.	<i>Medicago sativa</i> L.	Fabaceae	Lachko, Rajko	✓	✓
83.	<i>Mukia maderaspatana</i> (L.) M. Roem.	Cucurbitaceae	Chanak chibhdhi	✓	✓
84.	<i>Ocimum canum</i> Sims	Lamiaceae	Tukmaria, Jangli tulsi,	✓	✓
85.	<i>Oldenlandia corymbosa</i> L.	Rubiaceae	Parpati	✓	✓
86.	<i>Oplismenus burmannii</i> (Retz.) P. Beauv.	Poaceae		✓	✓
87.	<i>Orobanche cernua</i> Loefl.	Orobanchae	Vakumbho	✓	✓
88.	<i>Oxalis corniculata</i> L.	Oxalidaceae		✓	✓
89.	<i>Parthenium hysterophorus</i> L.	Asteraceae	Gajar ghas, Congress grass	✓	✓
90.	<i>Paspalum scrobiculatus</i> L.	Poaceae	Kodri	✓	✓
91.	<i>Pedalium murex</i> L.	Pedaliaceae	Gokhru	✓	✓
92.	<i>Phalaris minor</i> Retz.	Poaceae	Gullidanda	✓	✓
93.	<i>Phyllanthus fraternus</i> Webster	Euphorbiaceae	Bhoyamli	✓	✓
94.	<i>Phyllanthus maderaspatensis</i> L.	Euphorbiaceae	Bakarato	✓	✓
95.	<i>Physalis minima</i> L.	Solanaceae	Popti	✓	✓

Research Article

96.	<i>Polygala elongata</i> Klein ex Willd.	Polygalaceae		✓	✓
97.	<i>Portulaca oleracea</i> L.	Portulacaceae	Motiluni, Kutbo	✓	✓
98.	<i>Portulaca quadrifida</i> L.	Portulacaceae	Luni, Khati bhaji	✓	✓
99.	<i>Rhynchosia minima</i> (L.) DC. Var. <i>minima</i>	Fabaceae	Nani Kamalvel	✓	✓
100.	<i>Ruellia tuberosa</i> L.	Acanthaceae	Fatakdi	✓	✓
101.	<i>Rungia repens</i> (L.) Nees	Acanthaceae		✓	✓
102.	<i>Senna occidentalis</i> (L.) Link (Syn. <i>Cassia occidentalis</i> L.)	Caesalpiniaceae	Kasundri	✓	✓
103.	<i>Senna tora</i> (L.) Roxb. (Syn. <i>Cassia tora</i> L.)	Caesalpiniaceae	Kuvandio	✓	✓
104.	<i>Sida acuta</i> Burm. f.	Malvaceae	Bala	✓	✓
105.	<i>Sida cordata</i> (Burm. f.) Bors (Syn. <i>Sida veroicaefolia</i> Lam.)	Malvaceae	Bhoyabala	✓	✓
106.	<i>Sida cordifolia</i> . L	Malvaceae	Bala	✓	✓
107.	<i>Sida retusa</i> L.	Malvaceae	Atibala	✓	✓
108.	<i>Setaria tomentosa</i> (Roxb.) Kunth	Poaceae	Chiktu, Kutariyu	✓	✓
109.	<i>Solanum nigrum</i> L.	Solanaceae	Piludi	✓	✓
110.	<i>Solanum surattense</i> Burm. f.	Solanaceae	Bhoiringni	✓	✓
111.	<i>Sonchus oleraceus</i> L.	Asteraceae	Dudhli sonki	✓	✓
112.	<i>Spermacoce verticillata</i> L. (Syn. <i>Borreria stricta</i> (L. f.) Schum.)	Rubiaceae		✓	✓
113.	<i>Tephrosia purpurea</i> (L.) Pers.	Fabaceae	Sarpankho	✓	✓
114.	<i>Teramnus labialis</i> (L. f.) Spreng.	Fabaceae	Hathimathi	✓	✓
115.	<i>Trianthema portulacastrum</i> L.	Aizoaceae	Satodo	✓	✓
116.	<i>Tribulus terrestris</i> L.	Zygophyllaceae	Bethu gokhru	✓	✓
117.	<i>Tridax procumbens</i> L.	Asteraceae	Bhaglu, Pardesi bhangro	✓	✓
118.	<i>Triumfetta rhomboidea</i> Jacq.	Tiliaceae	Zipti	✓	✓
119.	<i>Vernonia cinerea</i> (L.) Less.	Asteraceae	Sahdevi, Sadedi	✓	✓

Research Article

Table 3: Family wise Chart Angadh and Fazalpur

Sr. No.	Family Name	Species per Family		Sr. No.	Family Name	Species per Family	
		Angadh	Fazalpur			Angadh	Fazalpur
1.	Acanthaceae	5	6	18.	Lamiaceae	3	3
2.	Aizoaceae	1	1	19.	Malvaceae	6	6
3.	Amaranthaceae	9	9	20.	Menispermaceae	1	1
4.	Apocynaceae	1	1	21.	Molluginaceae	1	1
5.	Asteraceae	9	9	22.	Nyctaginaceae	1	2
6.	Boraginaceae	1	1	23.	Orobanchaceae	1	1
7.	Caesalpiniaceae	2	3	24.	Oxalidaceae	1	1
8.	Capparaceae	1	1	25.	Pedaliaceae	1	1
9.	Chenopodiaceae	2	2	26.	Poaceae	23	25
10.	Commelinaceae	2	2	27.	Polygalaceae	1	1
11.	Convolvulaceae	2	3	28.	Portulacaceae	2	2
12.	Cucurbitaceae	1	1	29.	Primulaceae	-	1
13.	Cyperaceae	6	6	30.	Rubiaceae	1	2
14.	Elatinaceae	1	1	31.	Solanaceae	3	3
15.	Euphorbiaceae	6	5	32.	Tiliaceae	3	4
16.	Fabaceae	10	10	33.	Violaceae	-	1
17.	Gentianaceae	1	1	34.	Zygophyllaceae	1	1
Total Families						109	118

During the study close association between crops and particular agrestal was reported (Table 4). For e.g., along with wheat crop *Phalaris minor* Retz. (Gullidanda), *Chenopodium murale* L. (Chil balado), *Chenopodium album* L. (Chil), *Leucas aspera* (Willd.) Spr. (Kubi), *Enicostema axillare* subsp. *littorale* (Blume) A. Raynal (Mamejvo), *Cyperus rotundus* L. subsp. *rotundus* (Chido), *Dactyloctenium aegyptium* (L.) Willd. (Chokadiyu) are common agrestal species found in both the villages.

Studies indicated that increase in weed diversity have a positive impact on functioning of the agro-ecosystems (Albrecht, 2003; Norris and Kogan, 2005; Franke *et al.*, 2009). Weeds have been found to support beneficial ecological services such as pollination activity (Gabriel & Tscharntke, 2006) and prevent soil erosion (Walker, 1992; Zimdahl, 1993). Further, studies are required to relate the relation between the agrestal and the crop production.

Utilization of Agrestals: The uses of agrestals is depicted in the Table 5, 5A, 5B

Medicinal Purpose: Locals use some agrestals to cure or as a precaution measures for various type of illness. Agrestals are used for diseases like cough and cold, fever, dysentery, constipation, diabetes, eczema, jaundice, menstrual problem, piles, skin diseases, snakebite, toothache, vomiting, worm and others.

Food and Nutrition: In the present study it was found that 11 species were used as leafy vegetables (*Amaranthus*, *Purslane*, *Chenopodium*, *Leucas*, tender leaves of *Senna* etc.) and five species as Minor cereals (Table 5B). *Amaranthus virdis* L. and *Amaranthus spinosus* L., *Chenopodium album* L., have the potential as pseudo cereal crop or harvesting from agrestals itself as the seeds were also used as food in earlier time.

Research Article

Table 4: Crop-Agrestal Association Observed in Main Crop

Main Crop	Monocotyledon sp. with Local Name	Dicotyledon sp. with Local Name
Tobacco	<i>Cyperus rotundus</i> L. subsp. <i>rotundus</i> (Chido)	<i>Orobanche cernua</i> Loefl. (Vakumbho)
	<i>Dactyloctenium aegyptium</i> (L.) Willd. (Chokadiyu)	<i>Tribulus terrestris</i> L. (Bethu Gokhru)
	<i>Cynodon dactylon</i> (L.) Pers. (Dharo)	<i>Amaranthus spinosus</i> L. (Kanta sheriyu/Kantado tandaljo)
	<i>Digitaria adscendens</i> (H. B. & K.) Henrard (Syn. <i>D. sanguinalis</i> Scop. var. <i>ciliaris</i>) (Aarotaro)	<i>Portulaca oleracea</i> L. (Moti luni)
	<i>Oplismenus burmannii</i> (Retz.) P. Beauv.	<i>Chenopodium album</i> L. (Chil)
Wheat	<i>Cyperus rotundus</i> L. subsp. <i>rotundus</i> (Chido)	<i>Chenopodium album</i> L. (Chil)
	<i>Cynodon dactylon</i> (L.) Pers. (Dharo)	<i>Chenopodium murale</i> L. (Chil balado)
	<i>Phalaris minor</i> Retz. (Gullidanda)	<i>Leucas aspera</i> (Willd.) Spr. (Kubi)
	<i>Avena sterilis</i> L. var. <i>culta</i> (Syn. <i>Avena sativa</i> auct ron L.): (Jangli oat)	<i>Enicostema axillare</i> subsp. <i>littorale</i> (Blume) A.Raynal (Mamejvo)
	<i>Dactyloctenium aegyptium</i> (L.) Willd. (Chokadiyu)	<i>Leucas cephalotes</i> L. (Kubo)
Cotton	<i>Echinochloa colonum</i> (L.) Link (Samo)	<i>Euphorbia hirta</i> L. (bhony dudheli)
	<i>Echinochloa frumentacea</i> Link (Banti)	<i>Celosia argentea</i> L. (Lambdi)
	<i>Dinebra retroflexa</i> (Vahl) Panz. (Khariyu)	<i>Digera muricata</i> (L.) Mart. (Kanjaro)
	<i>Setaria tomentosa</i> (Roxb.) Kunth (Chiktu, Kutariyu)	<i>Trianthema portulacastrum</i> L. (Satodo)
	<i>Dactyloctenium aegyptium</i> (L.) Willd. (Chokadiyu)	<i>Vernonia cinerea</i> (L.) Less. (Fulekiyu, Sahdevi)
Pearl Millet	<i>Dactyloctenium aegyptium</i> (L.) Willd. (Chokadiyu)	<i>Trianthema portulacastrum</i> L.
	<i>Eleusine indica</i> (L.) Gertn. (Ukdo)	<i>Abutilon indicum</i> (L.) Sw. (Syn. <i>Sida indica</i> L.) (fundi, Khapat, Kanski)
	<i>Echinochloa colonum</i> (L.) Link (Samo)	<i>Euphorbia hirta</i> L. (Bhony dudheli)
	<i>Eragrostis poaeoides</i> P. Beauv. (Darudi)	<i>Phyllanthus fraternus</i> Webster (Bhony aamli)
	<i>Chloris barbata</i> Sw. (Kadiyu)	<i>Trianthema portulacastrum</i> L. (Satodo)
Ivy guard	<i>Eleusine indica</i> (L.) Gertn. (Ukdo)	<i>Trianthema portulacastrum</i> L. (Satodo)
	<i>Cynodon dactylon</i> (L.) Pers. (Dharo)	<i>Euphorbia hirta</i> L. (Bhony dudheli)
	<i>Oplismenus burmannii</i> (Retz.) P. Beauv.	<i>Sida acuta</i> Burm. f. (Bala)
	<i>Eragrostis ciliaris</i> (L.) R. Br. (Murmur)	<i>Phyllanthus fraternus</i> Webster (Bhony aamli)
	<i>Dactyloctenium aegyptium</i> (L.) Willd. (Chokadiyu)	<i>Boerhavia diffusa</i> L. (Satodi)

Research Article

Table 5: Utilization of Agrestals

Total No. of Plant	Angadh	Fazalpur
	105	114
Medicinally imp	22	22
Leafy vegetable	11	11
Minor cereal	5	5
Hindu rituals	3	3
Thatching and fencing	1	1
Fuel	4	4
Fodder	100	109
Mulching / Composting	104	113

Table 5A: Medicinally Important Agrestals

Sr. No.	Scientific Name	Local Name
1.	<i>Acalypha indica</i> L.	Dadro
2.	<i>Achyranthes aspera</i> L.	Anghedi
3.	<i>Blumea eriantha</i> DC.	
4.	<i>Blumea lacera</i> (Burm. F.) DC.	
5.	<i>Boerhavia chinensis</i> (L.) Druce	Punarnava
6.	<i>Boerhavia diffusa</i> L.	Punarnava
7.	<i>Cleome gynandra</i> L. (Syn. <i>C. pentaphylla</i> L.)	Gandhatu
8.	<i>Cocculus hirsutus</i> (L.) Diels	Vevti, Vevdi
9.	<i>Cyperus rotundus</i> L. subsp. <i>Rotundus</i>	Dhupel
10.	<i>Eclipta prostrata</i> (L.) L. Mant. (Syn. <i>Eclipta alba</i> (L.) Hassk.)	Bhangro
11.	<i>Enicostema axillare</i> subsp. <i>littorale</i> (Blume) A.Raynal	Mamejvo, Kadvi nai
12.	<i>Leucas aspera</i> (Willd.) Spr.	Kubo, Kubi
13.	<i>Ocimum canum</i> Sims	Tukmaria, Jangli tulsi
14.	<i>Pedalium murex</i> L.	Gokhru
15.	<i>Phyllanthus fraternus</i> Webster	Bhoyamli
16.	<i>Portulaca oleracea</i> L.	Motiluni, Kutbo
17.	<i>Solanum surattense</i> Burm. f.	Bhoiringni
18.	<i>Sonchus oleraceus</i> L.	Dudhli sonki
19.	<i>Trianthemum portulacastrum</i> L.	Satodo
20.	<i>Tribulus terrestris</i> L.	Bethu gokhru
21.	<i>Tridax procumbens</i> L.	Bhaglu, Pardesi bhangro
22.	<i>Vernonia cinerea</i> (L.) Less.	Sahdevi, Sadedi

Research Article

Table 5B: Edible Agrestals

Sr. No.	Scientific Name	Local Name	Uses
1	<i>Senna occidentalis</i> (L.) Link.	Kasundri	Leafy vegetable
2	<i>Senna tora</i> (L.) Roxb.	Kuvandio	Leafy vegetable
3	<i>Celosia argentea</i> L.	Lampdi	Leafy vegetable
4	<i>Chenopodium album</i> L.	Chil ni bhaji	Leafy vegetable
5	<i>Digera muricata</i> (L.) Mart.	Kanjaro	Leafy vegetable
6	<i>Amaranthus viridis</i> L.	Tandaljo	Leafy vegetable
7	<i>Leucas aspera</i> (Willd.) Spr.	Kubo, Kubi	Leafy vegetable
8	<i>Oxalis corniculata</i> L.	Khati bhaji	Leafy vegetable
9	<i>Portulaca oleracea</i> L.	Motiluni, Kutbo	Leafy vegetable
10	<i>Portulaca quadrifida</i> L.	Luni, Khari bhaji	Leafy vegetable
11	<i>Trianthema portulacastrum</i> L.	Satodo	Leafy vegetable
12	<i>Avena sterilis</i> L. var. <i>culta</i> (Syn. <i>Avena sativa</i> auct ron L.)	Oat	Minor cereal
13	<i>Echinochloa colonum</i> (L.) Link	Samo	Minor cereal
14	<i>Echinochloa frumentacea</i> Link	Banti	Minor cereal
15	<i>Eleusine coracana</i> (L.) Gaertn,	Bavto	Minor cereal
16	<i>Eleusine indica</i> (L.) Gertn.	Ukdo	Minor cereal
17	<i>Paspalum scrobiculatum</i> L.	Kodri	Minor Cereals

Fodder: Agrestals were commonly used as fodder by the villagers. The locals have adopted a different mechanism of using agrestals for fodder. The entire green weed is removed first and then inedible species like *Parthenium hysterophorus* L., *Achyranthes aspera* L., *Amaranthus spinosus* L., *Tribulus terrestris* L., *Pedalium murex* L are removed before using as fodder. Probably this is done to save time in the field.

Composting and Mulching: Locals are well aware of the importance of few species in improving soil conditions. For e.g. *Portulaca oleracea* L., *Trianthema portulacastrum* L. are excellent soil conditioners and improve the soil moisture and water holding capacity. After the crop harvesting, the agrestals are burnt along with the stubble to provide nutrients to the soils and improve nutrient cycling.

Other species like *Abutilon indicum* (L.) Sw are use for thatching and fencing. *Clitoria ternatea* L., *Ocimum canum* Sims, *Cynodon dactylon* (L.) Pers. Is used during various rituals. *Abutilon indicum* (L.) Sw., *Achyranthes aspera* L., *Senna occidentalis* (L.) Link, *Senna tora* (L.) Roxb. used as fuel.

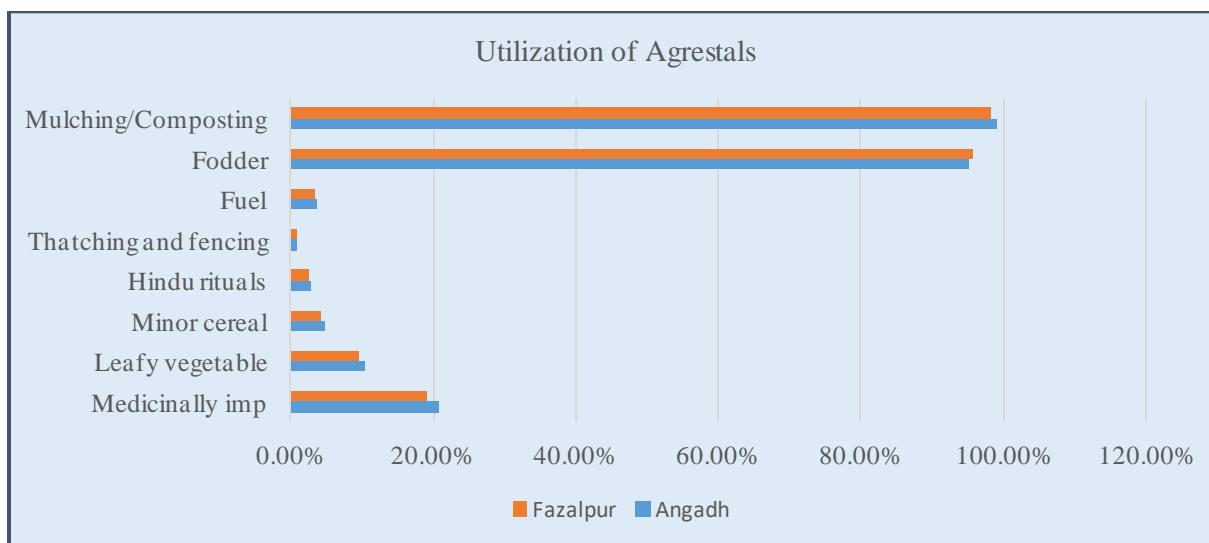


Figure 3: Utilization Percentage of Agrestals

Research Article

The present study concludes that 100% of species are used as fodder and for composting. Only 20% used for medicinal and less than 10% were used as food. The higher use of agrestals in fodder is to larger representation of grass species (Poaceae family). The area being ravenous support grass species in comparison to other species. The studies conducted have depicted substantial decline in agrestal species richness. *Parthenium hysterophorus* L. is the invasive (Rao, 1956) agrestal, which was found in the present study. Invasion has reduced species diversity of native agrestals and fodder yield quality and quantity (Adkins & Sowerby, 1996; Mahadevappa et al., 2001; Anonymous, 2005; Kohli et al., 2006; Dwari & Mondal, 2012; Kumari et al., 2014). Diversity in agrestal populations changes due to advancement in the cropping pattern and agro-technology. To effectively control the invasion of agrestals the best option available is to use the same as food supplements or forage.

Conclusion

Documenting the agrestal species and its relative distribution facilitates the establishment of priorities for research and extension services (Randall, 1996; Swaminathan, 1997; Hassan & Marwat, 2001, Jackson et al., 2005; Rana & Rana, 2015). There is higher percentage of plants used for fodder, medicinal purpose and food. The study provides base line data for further studies by pharmacognosist, ecologists, ethno botanist and pharmacologist for the collection an impact of agrestals on socio-economically and livelihood of villagers. *Parthenium hysterophorus* L. pose significant challenges to manage and to control invasion of such species certain important steps like special vigilance squad, public awareness are required.

“*Amontrum aksharam nasti, Nasti Mulam vanaostham, Ayogya Pursas nasti, Yoja Tatha Tatra durlabha.*” There is not a single letter in the word which do not have any meaning, there is no plant in the world which is not used, similarly, there is every plant species have potential for utilization, only there is need of good management.

REFERENCES

- Adkins SW and Sowerby MS (1996).** Allelopathic potential of the weed *Parthenium hysterophorus* L. in Australia. *Plant Protection Quarterly* **11** 20-23.
- Aher SK (2015).** Floristic diversity assessment of Parner tehsil, Maharashtra (India). *Indian Journal of Applied and Pure Biology* **30**(2) 123-130.
- Albrecht H (2003).** Suitability of arable weeds as indicator organisms to evaluate species conservation effects of management in agricultural ecosystems. *Agriculture, Ecosystems and Environment* **98** 201-211.
- Anonymous (2005).** Invasive Alien Species. Convention on Biological Diversity. *CBD Convention on Biological Diversity*.
- Auti BK, Pingale SD and Aher RK (2004).** Survey of weeds and their medicinal value from Shrirampurthahsil (Ahmednagar District (M.S.)). *Advances in Plant Sciences* **17**(II) 395-401.
- Bhandari DC and Sen DN (1979).** Agro-ecosystem analysis of the Indian arid zone *Indigofera cordifolia* as a weed. *Agro-ecosystems* **5**(3) 257-262.
- Bhattacharyya G (1996).** Medico-Ethno-botanical value of Saurashtra weeds. *Journal of Economic and Taxonomic Botany Additional Series* **12** 166-168.
- Boatman ND, Hart A, Clook M, Brown VK, Holland JM and Lutman PJW (2003).** A risk assessment framework for determining the effects of pesticides on farmland biodiversity. *Proceedings of the BCPC International Congress - Crop Science and Technology* 239-244.
- Cooke T (1967).** *Flora of Presidency of Bombay*, (Botanical Survey of India, Calcutta, India) **1-3**.
- Dwari S and Mondal AK (2012).** The impact, uses, and ecological role of agrestals in two selected agro-ecosystems of Eastern India. *International Journal of Biodiversity and Conservation* **4**(13) 472-480.
- Franke AC, Lotz L, Van Der Burg WJ and Van Overbeek L (2009).** The role of arable weed seeds for agroecosystem functioning. *Weed Research* **49** 131-141.
- Gabriel D and Tscharntke T (2006).** Insect pollinated plants benefit from organic farming. *Agriculture, Ecosystems & Environment* **118** 43-48.
- Gupta OP (2003).** *Weed Management*, second edition, (Agrobios (India) Publication, Jodhpur, India).

Research Article

- Hassan G and Marrwat KB (2001).** Integrated weed management in Agricultural crops. *Proceedings of the National Workshop on Technologies for Sustainable Agriculture*, NIAB, Faisalabad, Pakistan 27-34.
- Hawes C, Haughton AJ, Osborne JL, Roy DB, Clark SJ, Perry JN, Rothery P, Bohanda, Brooks DR, Champion GT, Dewar AM, Heard MS, Woiwod IP, Daniels RE, Young MW, Parish AM, Scott RJ, Firabank LG and Squire GR (2003).** Responses of plants and invertebrate trophic groups to contrasting herbicide regimes in the Farm Scale Evaluations of genetically modified herbicide-tolerant crops. *Philosophical Transactions of the Royal Society B* **358** 1899-1913.
- Hedge P (1994).** Conserving agricultural biodiversity and people's knowledge. In: *Biodiversity Conservation*, edited by Vandana Shiva, (Indian National Trust for Art and Cultural Heritage, New Delhi, India) 73.
- Holzner W and Numata N (1982).** *Biology and Ecology of Weeds* (Netherland, The Hague: Dr. W. Junk Publication) 456.
- Holzner W, Hayashi I and Glauninger J (1982).** Reproductive strategy of annual agrestals in *Biology and Ecology of Weeds* Holzner, W., Numata, N. (edition), (Netherland, The Hague: Dr. W. Junk Publication) 111-121.
- Hooker JD (1961).** *Flora of British India. L, 1-7*, (Reeve and Co. Ltd., London, UK).
- Jackson L, Bawa K, Pascual U and Perrings C (2005).** Agro biodiversity: A new science agenda for biodiversity in support of sustainable agro-ecosystems. DIVERSITAS Report N°4, 40. ISSN: 1813-7105- ISBN: 2-9522982-2-X© DIVERSITAS.
- Jain SK and Rao RR (1967).** *A Handbook of Field and Herbarium Methods* (Today and Tomorrow Printers and Publishers, New Delhi, India).
- Kohli RK, Batish DR, Singh HP and Dogra KS (2006).** Status, Invasiveness and Environmental Threats of Three Tropical American Invasive Weeds (*Parthenium hysterophorus* L., *Ageratum conyzoides* L., *Lantana camara* L.) in India. *Biological Invasions*, **8** 1501-1510. <http://dx.doi.org/10.1007/s10530-005-5842-1>
- Kumari P, Sahu PK, Soni MY and Awasthi P (2014).** Impact of *Parthenium hysterophorus* L. Invasion on Species Diversity of Cultivated Fields of Bilaspur (C.G.) India. *Agricultural Sciences* **5** 754-764. <http://dx.doi.org/10.4236/as.2014.58079>.
- Mahadevappa M, Das TK and Kumar A (2001).** Parthenium: A Curse for Natural Herbs. *National Research Seminar on Herbal Conservation, Cultivation, Marketing and Utilization with Special Emphasis on Chhattisgarh, Raipur* 9-10.
- Marshall EJP, Brown VK, Boatman ND, Lutman PJW, Squire GR and Ward LK (2003).** The role of weeds in supporting biological diversity within crop fields. *Weed Research* **43** 77-89.
- Nentwig W, Frank T and Lethmayer C (1998).** Sown weed strips: Artificial ecological compensation areas as an important tool in conservation biological control. *Conservation Biological Control* edited by P. Barbosa (Academic Press, San Diego, USA) 133-153.
- Norris RF and Kogan M (2005).** Ecology of interactions between weeds and arthropods. *Annual Review of Entomology* **50** 479-503.
- Petern BG (1955).** Soil-inhabiting nematodes. In: *Soil Zoology* (Butterworths Scientific Publication, London, UK) 44-54.
- Phatak VG and Oza GM (1958).** Some useful weeds of Baroda, its neighbourhood and Pavagarh. *Journal of Bombay Natural History Society* **55** 532-542
- Rahman AHMM (2013).** Assessment of Angiosperm Weeds of Rajshahi, Bangladesh with Emphasis on Medicinal Plants. *Research in Plant Sciences* **1**(3) 62-67.
- Rana SS and Rana MC (2015).** *Advances in Weed Management*, (Department of Agronomy, College of Agriculture, CSK Himachal Pradesh Krishi Vishvavidyalaya, Palampur, India) 195.
- Randall JM (1996).** Weed control for the preservation of biological diversity. *Weed Technology* **10**(2) 370-381.
- Rao RS (1956).** Parthenium, a new record for India. *Journal of Bombay Natural History Society* **54** 218-220.

Research Article

- Sankhwal A, Shah S and Gavali D (2013).** Traditional knowledge among the locals in two villages of Vadodara. *Journal of Biosciences Research* **4**(3) 72-81.
- Sankhwal A, Shah S, Gavali D and Dudani S (2015).** Riparian Flora of Mahi River, Gujarat. *Biolife* **3**(4) 820-826. doi:10.17812/blj.2015.3412
- Sarathambal C, Ilamurugu K, Srimathi P and Barman KK (2014).** A review on weeds as source of novel plant growth promoting microbes for crop improvement. *Journal of Applied and Natural Science* **6**(2) 880 – 886.
- Schellhorn NA and Sork VL (1997).** The impact of weed diversity on insect populations dynamics and crop yield in collards, *Brassica oleracea* (Brassicaceae). *Oecologia* **111** 233-240.
- Shah GL (1978).** *Flora of Gujarat State*, (S.P. University, Vallabh Vidhyanagar, Gujarat, India) **1-2**.
- Sharma BD, Kartikeyan S, Singh NP, Lakshminarasimhan P, Kartikeyan S and Prasanna PV (2001).** *Flora of Maharashtra State Dicotyledons* (Botanical Survey of India, Calcutta, India) **2**.
- Singh NP and Karthikeyan S (2000).** *Flora of Maharashtra State Dicotyledons* (Botanical Survey of India, Calcutta, India) **1**.
- Sotherton NW, Rands MRW and Moreby SJ (1985).** Comparison of herbicide treated and untreated headlands for the survival of game and wildlife. *British Crop Protection Conference: Weeds, Farnham, UK*.
- Spahillari M, Hammer K, Gladis T and Die derichsen A (1999).** Weeds as part of agro biodiversity. *Outlook on Agriculture* **28** 227-232.
- Storkey J (2006).** A functional group approach to the management of UK arable weeds to support biological diversity. *Weed Research* **46** 513-522.
- Storkey J and Westbury DB (2007).** Managing arable weeds for biodiversity. *Pest Management Science* **63** 517-523.
- Swaminathan MS (1997).** *Implementing the Global Biodiversity Convention: IPR for Public Good*, in: *Conservation and Economic Evaluation of Biodiversity*, **2**, Edited by Pushpagadan P, Ravi K & V Santhosh, (Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi, India), 399.
- The Plant List (2013).** *The Plant List Version 1.1*. Available: <http://www.theplantlist.org>.
- Walker BH (1992).** Biodiversity and ecological redundancy. *Conservation Biology* **6**(1) 18-23.
- Zimdahl RL (2013).** *Fundamentals of Weed Science*, (Academic Press, San Diego, California, USA) 664.