Studies on the Biodiversity of Weeds from V.P.M.'s College Campus and Adjoining Areas in Thane, India

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Abstract : Weeds are commonly considered as unwanted or undesirable plants in areas of specified human activities such as agricultural fields, horticultural cultivations, gardens, parks, lawns and landscaped areas. This mixed group of unrelated plants is adapted to grow aggressively and reproduce at phenomenal rates so as to spread far and wide and capture all available land within its reach. Weeds are known to occur in all natural habitats, cultivated lands, disturbed land habitats, degraded lands and also on roadsides and sites with human constructions. Generally considered a menace, weeds are also useful in several respects. Besides their use in traditional systems of medicine, they have applications in ethno-, tribal and veterinary medicines and have also been exploited by modern research in drugs as sources of novel phyto-compounds.

The biodiversity of winter weeds in Jnanadweepa, Vidya Prasarak Mandal's college campus, locally popular as 'Thane college' campus, and its adjoining areas, was studied in the present investigation. Ten locations within the college campus were earmarked for study which was carried out by the list quadrant method. Over forty five different broad and narrow leaved plants were recorded as weeds during the study; prominent amongst them were *Alternanthera sessilis*, *Amaranthus viridis*, *Cynodon dactylon*, *Euphorbia hirta*, *Cyperus* sps. and *Oxalis* spp.

Key Words: biodiversity, weeds, Thane college campus, grasses, sedges

Introduction

Weeds are best described as unwanted and undesirable plants that interfere with and hamper optimum usage of land, water, space and nutrients, and thus negatively affect crop yields and human interests in the long run. Many a times they are referred to as plants growing where they should not be; or, plants growing in the wrong places. Other than cultivated lands and orchards, weeds are known to occur practically everywhere. They are found on degraded lands, fallow lands, waste lands, disturbed land habitats, along road sides, along railway tracks, airfields, construction sites, at industrial locations, in and around human settlements, water channels, irrigation canals, water tanks, alongside ponds, lakes and water bodies inclusive of waste water nullahs and bunds. Their aggressive growth coupled with phenomenal rates of reproduction and capability to survive in challenging circumstances ensure their spread far and wide and result in capture of all available land within their reach by the notorious weeds. Weeds thus are much dreaded by farmers and horticulturists alike.

The harmful effects of weeds are greatest felt in agriculture where the unwanted weeds compete with crops for space, soil, water, nutrients, light and inputs; block irrigation channels with their prolific growth and ultimately reduce the yields of crops and their quality (ICAR, 2000). Weeds are also known to harbor insects, pests and harmful microorganisms, release poisonous toxins and growth inhibitory substances in the soil, thereby affecting surrounding cultivated plants (CSIR, 1992), live stock and human beings. Weeds are notorious because they increase the expenditure by involving the cumbersome process of weeding which has been described as one of the most labourous operations in agriculture (Puttoo, 2008). They are known to hamper harvesting operations. The losses caused by weeds in agriculture far exceed losses from all other categories taken together (Subramanian *et al*., 1995). Besides bringing about reduction in crop yield, weeds reduce land value, affect the quality of produce, affect human efficiency, and block water bodies resulting in impediments and death of fish. Several empowering factors bestowed by nature such as early germination of seeds, faster growth of seedlings, early maturity, early flowering, production of seeds in great profusion, extreme endurance, durability and physiological capabilities ensure superiority and wide distribution of weeds. The intense crop-weed competition is a science in itself. One of the significant developments in agricultural technology in recent times has been the usage of chemical means viz. herbicides for weed control and this is a cost effective and less laborious option (Shinde *et al*., 2013); while some prefer integrated weed management (Ghadage *et al*., 2013) however manual weeding practices are still considered the best option by many Indian farmers. In case of parks, lawns and gardens, weeds give an untidy appearance to the entire landscape and spoil the beauty.

As stated earlier, not all weeds are that much a menace as they are projected to be. Many weeds are actually useful and extremely beneficial to mankind in many respects. Most of the weeds are known to have medicinal attributes (Parrotta, 2001), traditional, ethno- and tribal-medicinal usages (Siddalinga Murthy and Vidyasagar, 2013), value as remedies against snake bites (Naidu *et al*., 2013), food value (CSIR, 1948; Singh and Shrivastava, 2013), fodder value (Relwani, 1979, Kulkarni and Kumbhojkar, 2003), traditional and local

veterinary medicinal usages (Tiwari and Tiwari, 2003), manurial and green manurial value (Padmaiah, 1999, Naikwade *et al*., 2011) and religious or sacred importance attached to them (Jasrai and Chaplot, 2003). Some weeds are commercially valuable (Kalbande, 2009) and some have, believe it or not, ornamental value (Courtier and Clarke, 1997). Useful and effective formulations for controlling termites (Ahmed, 2008), nematodes (Joshi *et al*., 2012) have been indigenously developed from weeds and many of these unwanted plants are gainfully looked upon as sources of anti microbial and anti fungal compounds (Rathore, 2009) as well as novel life saving phytochemicals (Yogesh *et al*., 2013). Marginal farmers consider weeds as an asset with food, fodder, socio-economic and soil conservation values (Singh and Tulachan, 2002). With this background, the current investigation was undertaken to create awareness about weeds and to study the diversity of weeds in the college campus.

The area of study viz. Jnanadweepa, popular amongst locals as Thane college campus is a spacious 13.5 acre island campus situated in the Chendani area of Thane city, alongside the Thane creek, near Thane railway station (Central Railway) on the outskirts of Mumbai, the commercial capital of India. Apart from housing some of the best educational institutes in the region, the world class campus also sports a huge biodiversity of micro and macro flora, both natural and cultivated. The well laid out gardens, lawns, landscaped grounds and open land for sports are a haven for growth of weeds in the monsoon season. The current study was undertaken after monsoon, to study and document winter weeds in the campus.

Materials and Methods

The study was carried out by employing the survey and quadrat methods for collection and compilation of data over a period of 3 months, from December 2012 to February 2013; wherein a physical survey of all weeds was carried out in the area of study. 1m X 1m quadrats were laid out at 12 locations of which location nos. 1-10 were within the campus and the remaining quadrats were outside and to the left and right sides of the main gate of the campus. The 10 locations within the college campus were as mentioned below:

Location 1: Area in front of the college cafeteria building

Location 2: Area to the left of the cafeteria building, inclusive of the sports ground

Location 3: Area behind the cafeteria

Location 4: Area to the right of the cafeteria building, inclusive of the NCC obstacle course

Location 5: Area behind the science college building.

Location 6: Area flanking the science college building

Location 7: Area in front of the student's gate and in between science, commerce and arts college buildings

Location 8: Area in front of the main gate, security cabin and fountain; law college flanks

Location9: Area around polytechnic building and shade net areas

Location 10: Area covering open air theatre in front of science college

The methodology recommended by Subramanian *et al*., (1991) was followed during the investigation.

The specimens were identified in the field and in the department of Botany, B.N. Bandodkar College of Science, a NAAC reaccreditated A Grade institute from amongst the VPM Group of Institutes, situated on the campus, using standard literature. The related facts presented in the section of results and discussion, were compiled from various sources, duly cited in the references section.

Results and Discussion

Weeding operations have been carried out since historical times in India and our farmers understood the ill effects (Tamboli, 2008) as well as the plus points of weeds (Watt, 1999). The importance and wisdom of weeding has been explained through historical maxims (Ahuja, *et al*., 2005) and *abhangas* (Patil, 2002).

A total of 51 weeds belonging to 24 families were recorded during the study. Plant families Amaranthaceae, Asteraceae, Malvaceae and Poaceae were represented by 5 specimens each; Euphorbiaceae and Fabaceae by 4 specimens, Solanaceae by 3 specimens, Capparidaceae, Commelinaceae, Cucurbitaceae, Cyperaceae and Tiliaceae by 2 specimens each and the rest had 1 representative each. The results are presented in Table 1. The results are in aggrement with lists of weeds released by ICAR, 2000.

Alternanthera sessilis (family Amaranthaceae) was the most abundant weed, recorded from all the 12 locations of study, followed by *Cynodon dactylon* (family Poaceae) which was recorded from 11 locations. Several weeds were located at only 1 location, but were nevertheless important from biodiversity point of view. The total number of specimens recorded at each location showed that locations within the college campus had a richer composition of weeds in comparison with locations outside. Locations outside the campus demonstrated heavy disturbance owing to excessive human activities, vehicular movements, animal and poultry related disturbances, which may all probably be responsible for the reduced flora. The abundant supply of water, favourable growth conditions and relatively less disturbance inside the educational campus probably are factors boosting development of flora in the area. The weeds were much more prolific and abundant during monsoon and lesser in the period of study, mainly due to the grass cutting

and weeding operations undertaken after monsoon on the campus.

Most of the weeds recorded were medicinally important and also had several other reported uses. *Calotropis gigantea* has been widely reported for its medicinal (Parrotta, 2001), ethnomedicinal (Ladda., *et al*., 2013), ethnoveterinary (Dwivedi and Singh, 2002) and green manure usage (Padmaiah, 1999). Vijigiri *et al*., 2013 reported usage of *Cynodon dactylon* and *Celosia argentea* for treatment of kidney stones. Lantana camara was reported to yield manure of excellent quality (Ghadge and Jadhav, 2013) and Riccinus communis, for its crop protective and manorial role (Reddy, 1998).

Conclusion

An impressive total of 51 weeds belonging to 47 genera were documented in the current investigation. Most of the weeds recorded were broad leaved.The rich biodiversity of weeds recorded on the Jnanadweepa campus calls for further studies.

Future Plans

It is planned to carry out a systematic season wise study of weeds all round the year for better understanding and awareness on the subject.

Acknowledgements

The authors gratefully acknowledge the co-operation, encouragement and inspiration received from Vidya Prasarak Mandal, Thane, the Principal, B. N. Bandodkar College of Science, Head of the Department of Botany, Department of Library and Information Science, Science Square, and help received from the gardeners and garden labour on the campus for completion of this project.

Table 1: Winter weeds recorded on VPM's Jnanadweepa campus and adjoining areas, Thane, India

S.No	Name of Plant/ Weed	Family	Location												
			1	2	3	4	5	6	7	8	9	10	11	12	% abundance
1	*Achyranthes aspera*	Amaranthaceae						+							8.3
2	*Alternanthera sessilis*	Amaranthaceae	+	+	+	+	+	+	+	+	+	+	+	+	100
3	*Amaranthus spinosus*	Amaranthaceae								+	+				16.6
4	*A. viridis*	Amaranthaceae	+	+		+		+	+	+	+	+		+	74.9
5	*Celosia argentea*	Amaranthaceae			+	+									16.6
6	*Centella asiatica*	Apiaceae			+										8.3
7	*Calotropis gigantea*	Asclepiadaceae		+	+										16.6
8	*Ageratum conyzoides*	Asteraceae			+	+	+		+					+	41.6
9	*Blumea lacera*	Asteraceae	+		+	+	+				+			+	50
10	*Eclipta prostrata*	Asteraceae		+	+	+	+		+		+				50
11	*Tridax procumbens*	Asteraceae					+		+		+	+			33.3
12	*Vernonia cinerea*	Asteraceae					+		+						16.6
13	*Cleome viscosa*	Capparidaceae	+		+		+	+	+						41.6
14	*Gynandropsis pentaphylla*	Capparidaceae	+				+	+	+	+	+	+			58.3
15	*Commelina benghalensis*	Commelinaceae									+				8.3
16	*Cyanotis axillaris*	Commelinaceae								+					8.3
17	*Coccinia indica*	Cucurbitaceae					+	+							16.6
18	*Diplocyclos palmatus*	Cucurbitaceae			+										8.3
19	*Cyperus rotundus*	Cyperaceae			+	+	+				+				33.3
20	*Cyperus* spp.	Cyperaceae	+				+								16.6
21	*Euphorbia hirta*	Euphorbiaceae	+				+	+		+	+	+	+		58.3
22	*Phyllanthus fraternus*	Euphorbiacea	+	+	+		+	+		+	+	+		+	75
23	*Phyllanthus* spp.	Euphorbiacea						+	+						16.6
24	*Riccinus communis*	Euphorbiacea			+						+				16.6
25	*Cassia tora*	Fabaceae-Caesalpinoideae	+	+							+			+	33.3
26	*Mimosa pudica*	Fabaceae-mimosoideae									+				8.3
27	*Mucuna pruriens*	Fabaceae-Papilionoideae		+											8.3

28	*Smithia spp.*	Fabaceae-Papilionoideae	+				+		+						25
29	*Ammannia baccifera*	Lythraceae						+	+			+			25
30	*Abelmoschus moschatus*	Malvaceae			+										8.3
31	*Malachra capitata*	Malvaceae			+	+		+							25
32	*Sida cordata*	Malvaceae		+	+	+		+							33.3
33	*Urena lobata*	Malvaceae		+	+			+	+		+				41.6
34	*U. sinuata*	Malvaceae						+							8.3
35	*Cocculus hirsutus*	Menispermaceae				+	+				+				25
36	*Oxalis corniculata*	Oxalidaceae	+	+			+	+	+	+	+				58.3
37	*Coix* spp.	Poaceae		+							+				16.6
38	*Cynodon dactylon*	Poaceae	+	+	+	+	+	+	+	+	+	+	+		91.6
39	*Cenchrus granularis*	Poaceae		+							+				16.6
40	*Paspalum spp.*	Poaceae			+		+	+	+	+	+				50
41	*Zea mays*	Poaceae							+						8.3
42	*Pteris* spp.	Polypodiaceae-Pteridaceae						+		+					16.6
43	*Portulaca oleracea*	Portulaceae					+					+	+	+	33.3
44	*Oldenlandia corymbosa*	Rubiaceae		+	+	+	+	+	+	+	+	+			75
45	*Scoparia dulcis*	Scrophulariaceae					+		+			+			25
46	*Datura metel*	Solanaceae			+										8.3
47	*Lycopersicon esculentum*	Solanaceae							+						8.3
48	*Physalis minima*	Solanaceae	+						+		+				25
49	*Corchorus capsularis*	Tiliaceae				+									8.3
50	*Triumfetta rhomboidea*	Tiliaceae				+		+							16.6
51	*Lantana camara*	Verbenaceae									+				8.3
			13	14	20	14	21	20	20	12	24	11	4	7	

References

Ahmed, S. 2008. Indigenous technique to control termites in tea plantations. *Asian Agri-History* **12** (3): 245-246.

Ahuja, U., Thakrar, R. and Ahuja, S.C. 2005. Agriculture in traditional wisdom of Haryana. *Asian Agri-History* **9** (2): 129-146.

Courtier, J. and Clarke, G. 1997. Indoor plants. Readers Digest Association Inc. pp 170.

CSIR. 1948. The Wealth of India, Raw Materials, Vol. 1. CSIR, Delhi. pp 64-67.

CSIR. 1992. The Wealth of India, Raw Materials, Vol. 3 (Rev.). Publications and Information Directorate, CSIR, New Delhi. pp 414-415.

Dwivedi, B.S. and Singh, R.K. 2002. Ethnoveterinary practices: an appraisal of tribal wisdom. *Asian Agri-History* **6** (4): 327-331.

Ghadge, S. and Jadhav, B. 2013. Effect of *Lantana* manures on nutrient content of fenugreek (*Trigonella-foenum graecum* L.). Bioscience Discovery 4 (2): 189-193.

Ghadage, L.D., Raut, P.D., Thakre, S.A and Shemberkar, R.Z. 2013. Effect of integrated weed management on growth and yield of garlic (*Allium sativum*). *J. Agric. Res. Technol.* **38** (1): 148-152.

ICAR. 2000. Handbook of Agriculture. Indian Council of Agricultural Research, New Delhi. pp 263-295.

Jasrai, Y.T. and Chaplot, B.B. 2003. Traditional knowledge on plant conservation linked to beliefs and religious rites. *Asian Agri-History* **7** (4): 319-325.

Joshi, G., Bhargava, S. and Sharma, M.K. 2012. Evaluation of fungal bio-agents and plant extracts for the management of *Meloidogyne incognita* in tomato. *J Mycol Pl Pathol* **42** (4): 523-525.

Kalbande, S.R. 2009. Biodiesel production from castor and palm oil and its utilization in diesel engine coupled electrical generator. *J Maharashtra agric Univ*. **34** (2) : 200-204.

Kulkarni, D.K. and Kumbhojkar, M.S. 2003. Ethno-agricultural study of Mahadeokolis in Maharashtra, India. *Asian Agri-History* **7** (4): 295-312.

Ladda, R.G., Aradwad, R.P. and Ambhore, J.S. 2013. Studies on herbal medicinal plants in Marathwada region (MS) India. Bioscience Discovery 4 (2): 211-213.

Naidu, M.T. Chandra Babu, N. and Venkaiah, M. 2013. Ethnic remedies against snake bite from Kotia hills of Vizianagaram district, Andhra Pradesh, India. *Indian Journal of Natural Products and Resources* **4** (2): 194-196.

Naikwade, P., Mogle, U. and Jadhav, B. 2011. Improving

total chlorophyll, ascorbic acid and â carotene in spinach by applying weed manures. *Bioscience Discovery* **2** (2): 251-255.

Padmaiah, M. 1999. Past and present experiences of an elderly farmer in Andhra Pradesh. *Asian Agri-History* **3** (3): 207-216.

Parrotta, J.A. 2001. Healing Plants of Peninsular India. CABI Publishing, Oxon, New York. pp 1- 736.

Patil, S.T. 2002. References to agriculture by Sant Tukaram. *Asian Agri-History* **6** (4): 351-355.

Puttoo, B.L. 2008. Traditional rice culture in Kashmir. . *Asian Agri-History* **12** (4): 285-297.

Rathore, B.S. 2009. Effect of plant extracts on foliar disease incidence and yield of green gram. *J Mycol Pl Pathol* **39** (2): 235-237.

Reddy, M.V. 1998. Some traditional crop protection practices of farmers in Andhra Pradesh. *Asian Agri-History* **2** (4): 317-323.

Relwani, L.L. 1979. Fodder Crops and Grasses. ICAR, New Delhi. pp 98-101.

Shinde, K.G., Bhalekar, M/N. and Patil, B.T. 2013. Weed management in rabi onion (*Allium cepa* L.). *J. Agric. Res. Technol*. **38** (2): 324-326.

Siddalinga Murthy, S.M. and Vidyasagar, G.M. 2013. Traditional knowledge on medicinal plants used in the treatment of respiratory disorders in Bellary district, Karnataka, India. *Indian Journal of Natural Products and Resources* **4** (2): 189-193.

Singh, P. and Shrivastava, D. 2013. Exploitation of weed plants as beneficial purpose. *J Biol Sci Opin* **1** (2): 123-127.

Singh, V. and Tulachan, P.M. 2002. Marginal farming in mountain areas. . *Asian Agri-History* **6** (3): 269-280.

Subramanian, S., Mohamed Ali, A. and Jaya Kumar, R. 1995. All About Weed Control. Kalyani Publishers, New Delhi. pp 1-11; 64-78.

Tamboli, P.M. 2008. Krishi Gita: a commentary. *Asian Agri-History* **12** (3): 247-251.

Tiwari, R. and Tiwari, R. 2003. Indigenous medicines for treatment of livestock in Terai region of Uttar Pradesh. *Asian Agri-History* **7** (2): 153-160.

Vijigiri, D., Bembrekar, S.K. and Sharma, P.P. 2013. Herbal formulations used in treatment of kidney stone by native folk lore of Nizamabad district, Andhra Pradesh, India. Bioscience Discovery 4 (2): 250-253.

Watt, G. 1999. Manures. *Asian Agri-History* **3** (4): 283-293.

Yogesh, H.S., Kichadi, S.C., Muchandi, I.S. and Gopalakrishna, B. 2013. Evaluation of anti-inflammatory activity of *Cynodon dactylon* Pers. on carrageenan induced paw edema in rats. *Indian Journal of Natural Products and Resources* **4** (2): 151-154.