

WEED FLORA OF KARNATAKA – CURRENT STATUS AND FUTURE PROSPECTS

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SUMMARY

The present report is focused mainly through a taxonomic perspective on some of the issues with regard to weeds of all agricultural fields, forests, rangelands, and natural ecosystems of Karnataka which is a key tool in managing weeds. Major invasive alien aggressive weeds in particular and weeds in general of Karnataka with their updated nomenclature, synonyms, common names, vernacular names (wherever available), brief description, their first reports, biology, reproduction, seed dispersal and longevity, distribution (Karnataka, India and World), phenology, uses, current impact and their management aspects are also discussed. In total, 390 weeds were collected, identified and preserved as voucher specimens and documented following routine herbarium procedures. Of the 70

families, Asteraceae is the dominant family with 41 weed species, followed by Poaceae (30), Fabaceae (28), Convolvulaceae (19), Malvaceae (19), Amaranthaceae (14), Acanthaceae (13), Euphorbiaceae (12), Cyperaceae (10), Solanaceae (10), Apocynaceae (9), Asclepiadaceae (8), Phyllanthaceae (8), Commelinaceae (7), Lamiaceae (7), Rubiaceae (7) and Boraginaceae (6). Other families with one or two species are also documented.

KEYWORDS: Invasive, weeds, prospects, Karnataka.

INTRODUCTION

Karnataka with rich biodiversity is endowed with some of the most magnificent forests in the country. From the majestic evergreen forests of the Western Ghats to the scrub jungles of the plains, a wide variety of habitats exist with very typical flora and fauna, some of them are endemic to the region. The Western Ghats, which covers about 60% of forest area of

Karnataka, and is biologically richest regions of the world and is recognized as one of the 35 biodiversity hotspots of the world and also as one of the 18-mega biodiversity hotspots of the world (Myer, 1988). Karnataka, with favorable and varied climatic conditions such as sufficient moisture, rainfall, temperature and light makes it vulnerable for the rapid establishment of alien weeds resulting in the aggressiveness of the weeds. Some of the worst aggressive weeds that have not only impacted human health but also altered the native flora and economic status and affected various crops produced within short span in Karnataka are discussed below. The present work is focused mainly through a taxonomic perspective on some of these issues with regard to weeds of all agricultural fields, forests, rangelands, and natural ecosystems of Karnataka which is a key to eradicate weeds. There has been tremendous interest in the study of weeds and their impact on native diversity.

Hundreds of publications in the form of research papers have appeared during last few years. A few books on weed flora, although not from the South Indian region have appeared. The only book dealing with the weeds of South India is that of 'A Handbook of some South Indian weeds' written 83 years ago (1932) by Tadulinga and Venkatanarayana. A similar book 'Weeds' of North India was written by Arora, Khanna and Ranvir Singh (1977), 'Weeds of Karnataka' by Shastry (1980) have appeared 35 years ago. Although these publications have their own merit, the nomenclature of the species in these books is very much outdated and also several recent introductions are missing. The present report is the study of three years i.e. from 2012-2015 survey of Karnataka. It is focused mainly through a taxonomic perspective on some of the issues with regard to weeds of all agricultural fields, forests, rangelands, and natural ecosystems of Karnataka which is a key tool in managing weeds.

MATERIALS AND METHODS

A detailed seasonal survey was done from 2012 to 2015. More than 390 weedy species in various agro-ecosystems, forest margins, roadsides, disturbed fields, and so on were collected. All the weed species collected are preserved as voucher specimens in the Herbarium of the botanical garden [University of Agricultural Sciences, Bengaluru (UASB)], Gandhi Krishi Vigyan Kendra (GKVK), Bengaluru following routine procedures. The identity and nomenclature of all weed species is checked with the help of available regional floras and other monographs. This study provides a detailed account of 390 weedy species belonging to 234 genera and 70 families occurring in various agro ecosystems of Karnataka.

The nomenclature is updated, species are enumerated with correct description, author citation, phenological data, distribution, collection numbers, flowering and fruiting, habitat, native, impact and uses (if any), synonyms and vernacular names. Collection numbers for each taxon is enumerated beside the places of collection in bracket as KS (Kavitha Sagar).

RESULTS AND DISCUSSION

Total of 390 weedy species of Karnataka are documented. Of the 70 families, Asteraceae is the dominant family with 41 weed species, followed by Poaceae (30), Fabaceae (28), Convolvulaceae (19), Malvaceae (19), Amaranthaceae (14), Acanthaceae (13), Euphorbiaceae (12), Cyperaceae (10), Solanaceae (10), Apocynaceae (9), Asclepiadaceae (8), Phyllanthaceae (8), Commelinaceae (7), Lamiaceae (7), Rubiaceae (7) and Boraginaceae (6) species. Other families with one or two species are also documented. Almost 70% of the weed species encountered in the present work are from the neo tropics. Most of the weeds are alien while a few are native. A vast majority of these alien weeds have become naturalized and seem to be the permanent denizens of Karnataka flora. A few aliens, particularly those that have established in the last century or so, have proved to be invasive and have taken a heavy toll of native biodiversity.

The dominant invasive weed floras across different agro-climatic zones found during surveys are *Alternanthera paronychioides*, *Alternanthera pungens*, *Calyptocarpus vialis*, *Chromolaena odorata*, *Hyptis suaveolens*, *Mikania micrantha*, *Parthenium hysterophorus*, *Prosopis juliflora*, *Richardia scabra*, *Ricinus communis*, *Senna uniflora*. In the aquatic systems species like *Azolla pinnata* *Eichhornia crassipes*, *Lemna*, *Pistia stratiotes* and *Salvinia adnata* are found to be aggressive.

Acanthospermum australe, *Alternanthera sessilis*, *Ambrosia artemisiifolia*, *Ambrosia psilostachya*, *Calyptocarpus vialis*, *Cynodon dactylon*, *Cyperus rotundus*, *Parthenium hysterophorus*, *Richardia scabra*, *Senna uniflora* emerge at higher densities and compete with crop plants resulting in reduction of potential yields of crops such as paddy, wheat, jowar, ground nut etc. which is quite common in almost all agricultural fields in Karnataka.

Acanthospermum australe, *Ambrosia artemisiifolia*, *Ambrosia psilostachya*, *Argemone Mexicana*, *Boerhavia erecta*, *Calyptocarpus vialis*, *Celosia argentea*, *Cynodon dactylon*, *Hibiscus hispidissimus*, *Mimosa invisa*, *Pennisetum pedicellatum*, *Pennisetum polystachion*, *Richardia scabra*, *Senna tora*, *Senna uniflora* are found to be the fast spreading and emerging

invasive aggressive weeds in Karnataka. They pose a serious problem to native flora and take heavy toll of herbaceous flora. Although some of the weeds covered in this book grow in limited areas, there is a possibility of these weeds spreading to many other areas over topping the native flora and becoming invasive in future. Therefore regular monitoring of these weeds for their spread is recommended.

It is observed that most of the weeds documented produce copious amount of seeds that are easily dispersed and readily germinate often forming compact cushions preventing the germination of all other local species. Further, it is noticed that human activities are greatly responsible for spread of some of the listed invasive species. It is hoped that the present throws light on the identification of all the weedy species of Karnataka and the biology of the weeds mentioned suggest some possible spread to other areas at an alarming rate due to their invasive nature in forthcoming years.

Article 8h of the Convention on Biological Diversity emphasizes the prevention of introduction of such alien weed species that threaten ecosystem, habitats or local species and their control. One such most recent introduction to Karnataka is the weedy species of *Senna uniflora* (Caesalpinaceae) that is seriously threatening native biodiversity and thus qualifies for immediate attention of all conservation biologists. It was first reported from North Karnataka (Singh, 1979). Within a short span of three decades, this weed has spread to many parts of Karnataka. In some places it has even replaced the equally nuisance causing *Parthenium*. In fact today this weed is the only dominant weed all along the roadsides and waste places in Central and Northern Karnataka with monospecific stands.

Another such dominant weed from several places in Karnataka was noticed. Reference to literature revealed that this species was first reported from Karnataka from Dharwad by Hebbar *et al.*, in 2002 as *Calyptocarpus vialis*; a member of Asteraceae. This species has been introduced into Bengaluru just 9-10 years ago and has become invasive forming dense compact, carpet like patches in moist shady places near footpaths, parks, roadsides, under the shade of large trees. Today this weed is the only ground cover that has even completely replaced many local species including the low grass cover. Considering its massive spread within a short span of less than a decade, it can be rightly presumed that this invasive weed is going to replace the entire flora in a couple of years, unless curative steps are initiated (Rao and Sagar, 2010).

Another Asteraceae, *Montanoa hibiscifolia* Benth., commonly known as tree daisy, is found at high altitudes along the forest margins throughout Kodagu, Dakshina Kannada and Uttara Kannada districts and spreading rapidly as a weed. Though there are no reports on its impacts, its rapid spread within the short span of 15 years directs us to predict its invasive nature in future. This weed is already reported to be invasive in South Africa, United States, Australia. Similarly *Sphagneticola trilobata* (Asteraceae) plant is spreading to wider areas in Karnataka. The IUCN has listed *S. trilobata* in its 100 of the world's worst invasive alien species list. In Karnataka it is seen as a fast growing weed in almost all districts. In India it is reported from Kerala, Maharashtra, Tamil Nadu, Uttar Pradesh. It is a vigorous perennial herb capable of forming a continuous herbaceous ground cover.

Ambrosia psilostachya, (Asteraceae), is an aggressive weed competing with crop plants for mineral and nutrition. Though this weed is not found anywhere in Karnataka except from Turuvekere, Tumakuru Distirct, but has locally established well. The spread of this weed must be checked at the earliest to prevent heavy loss of yield in agricultural fields (Ramachandra, Prasad *et al.*, 2013).

Richardia scabra (Rubiaceae), a native of North America, is found abundantly in monsoon after ploughing in agricultural fields in and around Bengaluru and Mysuru, may prove to be an aggressive weed affecting crop produce. *Mimosa invisa* (Leguminosae: Mimosoideae) is also seen spreading gregariously along roadsides, in disturbed fields, along the hedges of crop fields. *Celosia argentea* (Amaranthaceae) is another troublesome invasive weed in the crop fields. It is annual weed and the seeds will be dormant for more than six months in the soil and once monsoon starts the whole crop field will be infested by the seedlings. Karnataka with its varied habitats is a rich biodiversity state, has suffered most with the recent spread of invasive alien weeds such as *Mikania micrantha*, *Chromolaena odorata*, *Calyptocarpus vialis*, *Parthenium hysterophorus* and *Eichhornia crassipes* which have greatly altered the floristic composition of the native herbaceous flora in many localities. This is very much evident at University of Agricultural Sciences, GKVK campus in Bengaluru, where the extensive advance of *Calyptocarpus vialis* is dominant and is smothering the lower grass. A recent report by Kavitha and Rajanna (2015) mention that *C. vialis* has also altered the soil chemistry at the sites infested in Bengaluru and Mysuru districts. Thus, the emerging weeds mentioned above must be checked for further spread in newer and newer areas to retain the rich biodiversity of Karnataka.

Khuroo *et al.* recently reported that the alien flora of India amounts to 1599 species, belonging to 842 genera in 161 families and constituting 8.5% of the total vascular flora found in the country. In order to prevent future introductions, more weeds, particularly the ones that are problematic, need to be subjected to rigorous Weed Risk Analysis (WRA). Australia, New Zealand, USA have developed detailed protocols for WRA and for identification of quarantine weeds (Singh PK, 2013).

The information provided herein will contribute to the development of weed management technologies to check the spread of weeds. If early and effective measures to avoid the spread of these aggressive weeds are not initiated, in coming years, we will be forced to assimilate all such weeds among our native denizens as silent spectators.

Table 1: Major invasive and aggressive alien weeds of Karnataka.

| Species | Common name | Family |
|--|-----------------------|---------------------------------|
| <i>Argemone mexicana</i> L. | Mexican prickly poppy | Papaveraceae |
| <i>Azolla pinnata</i> R.Br. | mosquito fern | Salviniaceae |
| <i>Calyptocarpus vialis</i> Less. | straggler daisy | Asteraceae |
| <i>Chromolaena odorata</i> (L.) King & Robinson | Siam weed | Asteraceae |
| <i>Croton bonplandianum</i> Baill. | three leaved caper | Euphorbiaceae |
| <i>Cyperus rotundus</i> L. | nut grass | Cyperaceae |
| <i>Eichhornia crassipes</i> (Mart.) Solms. | water hyacinth | Pontederiaceae |
| <i>Hyptis suaveolens</i> (L.) Poit. | bush mint | Lamiaceae |
| <i>Ipomoea fistulosa</i> Mart. ex. Choisy | pink morning glory | Convolvulaceae |
| <i>Lantana camara</i> L. | lantana | Verbenaceae |
| <i>Mikania micratha</i> Kunth. | Chinese creeper | Asteraceae |
| <i>Parthenium hysterophorus</i> L. | congress weed | Asteraceae |
| <i>Pistia stratiotes</i> L. | water lettuce | Araceae |
| <i>Prosopis juliflora</i> (Sw.) DC. | Texas mesquite bean | Leguminosae: Mimosoideae |
| <i>Richardia scabra</i> L. | rough Mexican clover | Rubiaceae |
| <i>Ricinus communis</i> L. | castor oil plant | Euphorbiaceae |
| <i>Salvinia adnata</i> Desv. | water fern | Salviniaceae |
| <i>Senna uniflora</i> (Mill.) H.S. Irwin & Barneby | one leaf senna | Leguminosae: Caesalpiniaceae |
| <i>Pennisetum polystachion</i> (L.) Schult. | elephant grass | Poaceae |

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