

VEGETATION OF CATCHMENT AND SUBMERGENCE AREAS UNDER SOM
KAMALA AMBA IRRIGATION PROJECT, DUNGARPUR, RAJASTHAN

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ABSTRACT

The present paper deals with the flora and floral composition of catchment and submergence areas under Som Kamala Amba Irrigation Project, Dungarpur. About 192 species belonging to 156 genera and 67 families inhabit the region forming various associations and often pure stands in different habitats. No endemic, endangered, vulnerable and threatened taxon grows in this area.

INTRODUCTION

Som Kamala Amba Irrigation Project is under construction on the river Som—a tributary of the river Mahi, at the north-eastern border of Dungarpur district in Ashpur Tehsil. The river Som originates from the hills near Bichabhera in Udaipur district. It flows in north-easterly direction forming the northern and north-east boundary of Dungarpur district. In the north-east of Ashpur, it turns to south, joining the Mahi river near Boreshwar. Gomti is the only notable tributary feeding the river Som. The Dam is under construction at about 7 km north-east of Ashpur at an altitude of 200 m above m.s.l. The gross catchment area is 5376 sq. km and submergence area starts from the point of the junction of Gomti and Som rivers covering about 127.19 sq. km area at 74°2'E longitude and 23°58'N latitude. About 2806 ha of submergence area is under cultivation and rest covers scrub forests, wastelands and habitations. The human population of submergence area is about 18,084 i.e. 142/sq. km. The main occupation of tribals is agriculture and animal husbandry. The living of the people is much below the poverty line. For increasing irrigation faci-

lities, two canals from the right and left flanks of the Dam are under work. The right canal will be about 20 km long with 1758 ha command area and left canal will be 10 km long with 666 ha command area.

CLIMATE

The climate of the area is semi-arid, with an annual rainfall between 600-800 mm and maximum temperature between 32-38°C. The soils of catchment and submergence area fall under the broad category of red-loam (Bhuri), black soils (Kali) and mixture of the two (Berangi). The hillocks have gravelly soils and river-beds are characterized by well drained sandy-loam to clay-loam soils. The pH value varies from 6-7, indicating alkaline nature of the soils. Relative humidity is more than 90 per cent during summers. Depressions and cyclonic storms originating in Bay of Bengal during monsoon affect the area towards the later stage of movement resulting in heavy rains and gusty winds. Dust storms occur occasionally during summers.

VEGETATION

The vegetation is xerophytic in character, degraded to critical stage due to deforestation and grazing activities. A perusal of literature concerning vegetation of Rajasthan (Jain, 1972 ; Sharma, 1980) revealed that

there is no publication on the flora of Dungarpur district. The adjoining districts viz., Udaipur and Banswara have, however, been intensively explored (Ramdeo, 1969 ; Singh, 1983). The present attempt to study the flora and floral composition and the impact of biotic activities on the vegetation of submergence and catchment areas under this project will have its own importance since after the completion of the Dam, the present ecosystems will largely change in character and content. The original flora and fauna of today will disappear for ever. And then, the present work, though confined to small area, will throw considerable light on the past vegetation types of the area.

The floral composition of catchment and submergence area as per their habitats is given below.

1. Hills and hillocks

Various outcrops of the Aravallis, consisting quartzite-schists formations form the right and left flanks of the area with altitude not exceeding 400 m above m.s.l. Most of the hills are excessively stony and bare of soil as they are under great biotic and climatic pressure. The tree species are few in number and density and represented by *Acacia leucophloea* (Roxb.) Willd., *Anogeissus latifolius* (Roxb. ex DC.) Wall. ex Guill. & Perr., *A. pendula* Edgew., etc. *Lannea coromandelica* (Houtt.) Merr., *Boswellia serrata* Roxb. ex Colebr., *Sterculia urens* Roxb., *Butea monosperma* (Lam.) Taub. and *Tectona grandis* L. f. which are characteristic representatives of mixed deciduous forests all over the Aravallis, are very poorly represented in this region. The hills of low altitude in the submergence area are dominated by *Cassia auriculata* L.; the other associates are *Anogeissus pendula* Edgew. (browsed), *Acacia leucophloea* (Roxb.) Willd., *Dichrostachys cinerea* (L.) Wt. & Arn., *Euphorbia caducifolia* Haines,

Cassia occidentalis L., *Ziziphus nummularia* (Burm. f.) Wt. & Arn. etc. The hills with comparatively high altitude in catchment area are dominated by *Anogeissus pendula* Edgew.; the other associates are the same as on low hills but the frequency and density of tree species is higher.

1. *Cassia auriculata*—*Acacia leucophloea*—*Anogeissus pendula*—*Euphorbia caducifolia* association at low hills.

2. *Anogeissus pendula*—*Acacia leucophloea*—*Cassia auriculata*—*Ziziphus nummularia* association at high hills.

At the foot of hills, *Cassia occidentalis* L., *Argemone mexicana* L., *Jatropha gossypifolia* L., *Echinops echinatus* Roxb. etc. form different associations and pure stands.

The herbaceous flora provides greenery to these hills during rainy season when a large number of annuals and perennials make their appearance above the ground ; otherwise the hills are naked for rest of the year and only a few hardy species like *Actinopteris radiata* (Sw.) Link, *Adiantum incisum* Forssk., *Evolvulus alisnoides* (L.) L., *Convolvulus prostratus* Forssk., *Tridax procumbens* L., *Indigofera cordifolia* L., *Gnaphalium pulvinatum* Delile, *Vernonia cinerea* (L.) Less., *Blepharis repens* (Vahl) Roth etc. and some species of grasses survive in adverse conditions. During monsoon season from July to October, however, many additional taxa viz., *Alysicarpus monilifer* (L.) DC., *Biophytum sensitivum* (L.) DC., *Borreria articularis* (L.) Will., *B. pusilla* (Wall.) DC., *Cassia pumila* Lam., *Catharanthus pusillus* (Murr.) G. Don, *Elytraria acaulis* (L. f.) Lindau, *Glossocardia bosvallia* (L.f.) DC., *Hybanthus enneaspermus* (L.) Muell., *Oldenlandia corymbosa* L., *Orthosiphon pallidus* Royle ex Benth., *Acanthospermum hispidum* DC., *Rostellularia quinqueangularis* (Koen. ex Roxb.) Nees and grasses like *Melanocenchris jacquemontii* Jaub. & Spach., *Oropetium thomaeum* (L.f.)

Trin., *Tragus roxburghii* Panigr., *Oplismenus compositus* (L.) P. Beauv. etc. also appear.

2. Undulating tectonic plains and rock outcrop

A vast area, excluding cultivated fields and hills, is excessively rocky without any soil cover or with a very thin layer of soil. *Euphorbia caducifolia* Haines is the chief component of such habitats. The trees are very few and scattered e.g. *Acacia leucophloea* (Roxb.) Willd., *A. nilotica* (L.) Del. subsp. *indica* (Benth.) Brenan, *A. senegal* (L.) Willd. etc. Among shrubs *Capparis decidua* (Forssk.) Edgew., *C. sepiaria* L., *Leptadenia pyrotechnica* (Forssk.) Decne., *Maytenus emarginatus* Ding Hou, *Kirganelia reticulata* (Poir.) Baill., *Ziziphus nummularia* (Burm. f.) Wt. & Arn. are common forming thickets with *Euphorbia caducifolia* Haines. The frequent climbers are *Wattakaka volubilis* (L.) Stapf, *Rivea hypocrateriformis* (Desr.) Choisy, *Rhynchosia minima* (L.) DC., *Atylosia scarabaeoides* (L.) Baker, *Cocculus hirsutus* (L.) Diels, *Cardiospermum halicacabum* L., *Abrus precatorius* L., *Pergularia daemia* (Forssk.) Chiov. and *Marsdenia tenacissima* (Roxb.) Moon.

A considerable number of annual and perennial herbs and undershrubs viz. *Indoneesiella echioides* (L.) Sreem., *Boerhavia procumbens* Banks ex Roxb., *Borreria articularis* (L. f.) Willd., *Cassia pumila* Lam., *C. tora* L., *C. obtusifolia* L., *Cleome viscosa* L., *Convolvulus prostratus* Forssk., *Corchorus aestuans* L., *Echinops echinatus* Roxb., *Glossocardia bosvallia* (L. f.) DC., *Goniogyna hirta* (Willd.) Ali, *Indigofera cordifolia* Heyne ex Roxb., *I. linifolia* (L.) Retz., *I. linnaei* Ali, *I. trita* L. f., *Solanum surattense* Burm. f., *Tribulus terrestris* L. etc. and the grasses, like *Aristida adscensionis* L., *Cenchrus ciliaris* L., *C. setigerus* Vahl, *Dactyloctenium aristatum* Link, *Melanocen-*

chris jacquemontii Jaub. & Spach., *Tragus roxburghii* etc., grow in dry rocky habitats.

In the depressions, where rainy water accumulates and there is comparatively a thick layer of soil, herbs like *Acalypha ciliata* Forssk., *Ageratum conyzoides* L., *Alysicarpus monilifer* (L.) DC., *Argemone mexicana* L., *Blumea obliqua* (L.) Druce, *Cleome viscosa* L., *Commelina benghalense* L., *Corchorus olitorius* L., *Indigofera tinctoria* L., *Ocimum americanum* L., *Tephrosia purpurea* (L.) Pers. etc. also come up during post monsoon season.

The growth of *Euphorbia caducifolia* Haines is poor in depressions, while *Ziziphus nummularia* (Burm. f.) Wt. & Arn. along with *Calotropis procera* (Ait.) R. Br. is more abundant. Certain tall grasses like *Dactyloctenium aegyptium* (L.) Willd., *Alloteropsis cimicina* (L.) Stapf, *Bothriochloa pertusa* (L.) A. Camus, *Chloris virgata* Sw., *Chrysopogon fulvus* (Spreng.) Chiov., *Dichanthium annulatum* (Forssk.) Stapf, *Digitaria adscendens* (H.B.K.) Henr., *Dinebra retroflexa* (Vahl) Panz., *Eragrostis diarrhena* (Schult.) Steud., *E. japonica* (Thunb.) Trin., *Heteropogon contortus* (L.) P. Beauv. ex R. & S., *Setaria tomentosa* (Roxb.) Kunth and *Sporobolus diander* (Retz.) P. Beauv. which are rather uncommon in upland habitats, are more abundant in depressions.

3. Aquatic and Marshland habitats

The river Som presents variable emporia for the growth of aquatic and marshland plants during post monsoon and winter season due to its sandy beds and shallow slow running or stagnant water. The following life-forms were noted on the banks of the river at different places.

A. Attached with floating leaves/shoots : The species like *Ipomoea aquatica* Forssk., *Nymphoides cristata* (Roxb.) Kuntze, *Marsilea* species represent this group.

B. Suspended submerged : *Hydrilla verti-*

cillata (L. f.) Royle, *Najas minor* All., *Potamogeton pectinatus* L., *Zannichellia palustris* L., *Ceratophyllum demersum* L. etc. fall in this category.

C. Attached submerged : The species like *Ottelia alismoides* (L.) Pers., *Potamogeton crispus* L., *Vallisneria spiralis* L. etc. form this group of hydrophytes.

D. Aquatic and/or amphibious emerged : *Hydrolea zeylanica* (L.) Vahl, *Polygonum glabrum* Willd., *Typha angustata* Bory & Chaub., *Crinum defixum* Ker-Gawl. etc. constitute this group.

E. Marshland : The species like *Ammania baccifera* L., *Polygonum plebeium* R. Br., *Caesulia axillaris* Roxb., *Alternanthera sessilis* (L.) DC., *Phyla nodiflora* (L.) Greene, *Bergia ammannioides* Roxb. ex Roth, *Peplidium maritimum* (L. f.) Wettst., *Bacopa monnieri* (L.) Pennell, *Cyperus difformis* L., *C. pygmaeus* Rottb., *C. pangorei* Rottb., *Fimbristylis bisumbellata* (Forssk.) Pub., *F. shoenoides* (Retz.) Vahl, *Scirpus tuberosus* Desf., *S. supinus* L., *Eleocharis atropurpurea* (Retz.) Presl etc. form the marshland flora of the area.

Further, the coarse sandy and rocky beds of the river support thick growth of *Tamarix dioica* Roxb. ex Roth, together with scattered patches of *Cassia auriculata* L., *Jatropha gossypifolia* L. and *Leptadenia pyrotechnica* (Forssk.) Decne. Under the shade of these bushes in moist habitats *Parthenium hysterophorus* L., *Eragrostis ciliaris* (L.) R. Br., *Euphorbia granulata* Forssk., *Launaea asplenifolia* (Willd.) Hook. f., *L. procumbens* (Roxb.) Rama. & Rajag., *Tridax procumbens* L., *Argemone mexicana* L., *Corchorus aestuans* L., *Xanthium strumarium* L., *Cassia obtusifolia* L., *C. tora* L., *C. occidentalis* L., *Blumea obliqua* (L.) Druce etc. make their home till the area is again flooded during monsoon season.

The tanks used for irrigation are mostly devoid of vegetation, however, the streams

brought out for irrigation are rather more suitable habitats for many aquatics like *Typha angustata* Bory & Chaub., *Ottelia alismoides* (L.) Pers., *Marsilea* species, *Ipomoea aquatica* Forssk., etc. together with some grasses like *Paspalidium flavidum* (Retz.) A. Camus, *P. geminatum* (Forssk.) Stapf, *Paspalum vaginatum* Swartz, *Pycneus flavidus* (Retz.) Koyama, *Eriocaulon quinqueangulare* L., *Eleocharis atropurpurea* (Retz.) Presl and many species of *Cyperus* L.

In low-lying areas *Phoenix sylvestris* (L.) Roxb. forms pure stands from miles to miles.

4. Crops and weeds

Two main crops viz. Rabi (Wheat, Gram, Mustard etc.) and Khariff (Maize, Jowar, Cotton, Pulses, Sugarcane etc.) are grown in the area. Where irrigation facilities exist and on sandy river-beds a few vegetables particularly Tomato, Brinjal, Chillis, Bhindi etc. are also cultivated but on a low scale. During summers many cucurbitaceous climbers are grown for fruits and vegetables.

In Rabi crop fields, weed-flora is very poorly represented excepting in the fields which are irrigated, wherein some weeds which have wide range of adaptability like *Chenopodium album* L., *Digera muricata* (L.) Mart., *Launaea procumbens* (Roxb.) Ramay. & Rajag., *Solanum surattense* Burm. f., *Euphorbia hirta* L., *Leucas cephalotes* (Koen. ex Roth) Spreng., *Vernonia cinerea* (L.) Less., *Acalypha ciliata* Forssk., *Indoneesiella echiodides* (L.) Sreem. and some grasses like *Cynodon dactylon* (L.) Pers., *Dichanthium annulatum* (Forssk.) Stapf and *Cenchrus ciliaris* L. compete with the crops.

The density and frequency of weed-flora is comparatively high amidst khariff crops and most of the weeds are those growing in the wastelands like *Indigofera cordifolia* L., *I. linifolia* L., *Euphorbia hirta* L., *Oxalis corniculata* L., *Celosia argentea* L., *Corchorus aestuans* L., *C. olitorius* L., *Digera muricata*

(L.) Mart., *Cynodon dactylon* (L.) Pers., *Leucas cephalotes* (Koen. ex Roth) Spreng., *Pentstemon indicum* (L.) Ling, *Trianthema portulacastrum* L., *Commelina benghalensis* L., *Ageratum conyzoides* L., *Eclipta alba* (L.) Hassk.

On the bunds of cultivated fields *Euphorbia caducifolia* Haines is planted for fencing and protecting the crops from animals. The fencing forms suitable media for the growth of a number of climbers like *Cocculus hirsutus* (L.) Diels., *Cissampelos pareira* L., *Tinospora cordifolia* (Willd.) Miers, *Dioscorea bulbifera* L., *Wattakaka volubilis* (L. f.) Stapf, *Abrus precatorius* L., *Ipomoea obscura* (L.) Ker-Gawl., *I. nil* (L.) Roth, *Mucuna pruriens* (L.) DC., *Canavalia ensiformis* (L.) DC., *Cardiospermum halicacabum* L., *Coccinia grandis* (L.) Voigt, *Mukia maderaspatana* (L.) Roem., *Pergularia daemia* (Forssk.) Chiov. etc., together with a large number of shrubs and undershrubs like *Abutilon ramosum* (Cav.) Guill. & Perr., *A. indicum* (L.) Sweet, *Hibiscus ovalifolius* (Forssk.) Vahl, *Plumbago zeylanica* L., *Clerodendrum phlomidis* L. f., *Boerhavia procumbens* Banks ex Roxb., *Peristrophe bicalyculata* (Retz.) Nees, *Grewia flavescens* Juss. etc. and grasses like *Sorghum halepense* (L.) Pers., *Apluda mutica* L. further make the fencing impenetrable.

5. Near habitations

A large number of trees, which are rather uncommon in the forests and wastelands etc., thrive well near habitations. Some of them are exotics and planted but majority represent the original flora which has disappeared due to great biotic pressure for timber and fuel-wood. The common trees are *Madhuca longifolia* (Koen.) Macbr., *Salvadora persica* L., *S. oleoides* Decne., *Wrightia tinctoria* R. Br., *Holoptelea integrifolia* (Roxb.) Planch., *Bombax ceiba* L., *Ailanthus excelsa* Roxb., *Ricinus communis* L., *Delonix elata* (L.) Gamble, *Azadirachta indica*

Juss., *Mangifera indica* L., *Tamarindus indica* L., *Ficus religiosa* L., *Ziziphus mauritiana* Lam., *Albizia lebbek* (L.) Benth., *A. procera* Benth., *Acacia nilotica* (L.) Del., *Pongamia pinnata* (L.) Pierre etc. Attempts have also been made to plant *Eucalyptus* species but success seems insignificant. *Prosopis juliflora* (Sw.) DC. is also very poorly represented in the area. Among the herbs *Achyranthes aspera* L. is more abundant.

6. Special habitats

It is interesting to report *Cuscuta hyalina* Roth—the only stem-parasite; no epiphyte, no saprophyte, no orchid, no insectivorous plants in the area. On the walls of old buildings *Barleria prionitis* L. and *Euphorbia tirucalli* L. are characteristic representatives.

CONCLUSION

The floristic composition of catchment and submergence area suggests semi-arid climate due to the abundant ground cover during rainy season, deciduous scrub forests, distantly scattered trees, dense growth of xerophytic shrubs etc. The floristic analysis of the area is as under :

	Pteridophytes		Dicotyledons		Monocotyledons		Grand
	No.	% of total	No.	% of total	No.	% of total	Total
Families	3	4.4	52	77.6	12	17.9	67
Genera	3	1.9	113	72.4	40	25.6	156
Species	3	1.56	137	71.3	52	27.0	192

The floristic analysis shows that no gymnosperm grows in the area, pteridophytes are very poorly represented and among angiosperms dicots are better represented than monocots. Among dicots polypetalae (65) is abundant in comparison to the gamopetalae (55) and monochlamydeae (17). A comparative study of the vegetation with other part of the district and neighbouring districts (Banswara and Udaipur) revealed that characteristic elements of deciduous

forests like *Tectona grandis* L. f., *Boswellia serrata* Roxb. ex Colebr., *Lannea coromandelica* (Houtt.) Merr., *Lantana camara* L., *Butea monosperma* (Lam.) Taub. etc. are very poorly represented in this area. Among aquatics, no free-floating life-form could be observed. The vegetation of protected habitats and information collected from the forest officials and local people revealed that the forests have largely disappeared due to indiscriminate felling of trees. In 1948, soon after the formation of present state of Rajasthan, a political agitation claiming that the forests belonged to the Bhils was launched and trees were cut down forcibly in large areas and many of the forests were set on fire. Remote areas were encroached upon for cultivation without restriction under "Grow more food campaign". Increased pressure of population has also told heavily on the forests for timber and fire-wood. All these biotic activities have resulted in the formation of lithophytic desert of today,

not only in this area but throughout the Aravalli range.

Further, there are no endangered, vulnerable, threatened, rare and endemic taxa in this area. The specimens collected by the author are deposited in the herbarium of Arid Zone Circle, BSI, Jodhpur (BSJO).

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