



Biodiversity in Rose

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Introduction

The term biodiversity was coined by Walter G. Rosen in 1985 for the first planning meeting of the 'National Forum on Biodiversity' held in Washington, DC in September 1986. Biological diversity or Biodiversity refer to the variability among living organism from all the sources including marine, terrestrial and other eco system of which they are part; this includes diversity with in species, between species and of ecosystems. Biodiversity also supports a number of natural ecosystem processes and services. Some ecosystem services that benefit society are air quality, climate (both global CO₂ sequestration and local), water purification, pollination, and prevention of erosion. It is quite difficult to say how many species of life exist on our earth? As per available literature this estimates ranges from 3 million to 100 million. There are 1,435,662 identified species present all over the world (Singh, 2010). The details of identified species are given below:

Species of Insect	751,000
Flowering plants	250,000
Animals	281,000
Fungi.....	68,000
Protists (unicellular and.....	30,000
Colonial eukaryotes)	
Algae.....	26,900
Bacteria and other similar forms.....	4,800
Viruses	1,000

The United Nations proclaimed May 22 as the

International Day for Biological Diversity (IDB) to increase understanding and awareness of Bio-diversity issue. Biological diversity of India is richest in the world. India has over two per cent of the world's land mass (329 million hectares). It has seven per cent of living resource, one third of which is land bounded (Ramasubbu, 2010). Approximately, 45,000 species of plants have been reported from here. The main reason of this diversity of the plant is due to presence of vast geographical area, varied topography, climate zones and so many biogeographically regions and sub-regions. Wild ornamental always played an important role in the beautification of the forest areas and during the course of evolution attracting various insects for pollination. More than 200 wild ornamental species are domesticated and used intensively for commercial floriculture and rose is one of them.

The present paper deals with the biodiversity of rose. Rose plant appeared on earth about 30 million years ago. This has been deduced by the study of the fossil found in Asia, Europe and America (Chakraborty, 2005). There is wide biodiversity in roses which is described in literature in the name of wild roses, natural roses, scented roses, miniature roses, species roses, cabbage roses, moss roses, old roses, modern roses and climbing roses. It clearly indicates that wide biodiversity is already available in genus rose. To know how the biodiversity appeared in rose, it is important to know about its origin and distribution in globe.

Origin of rose

Roses evolved much before man, even before the



earth was inhabited by mankind as per evidence of fossil record. The flower also found a special place with the Egyptian pharaohs, whose pyramids has rose buried along with themummies. During the excavation, essence of the rose flower was felt (Bhattacharjee and Banerji, 2010, Anonymous, 2011). In floriculture industry and cut flower trade, roses occupies top slot and are in huge demand.

Roses are not indigenous to South Africa, mainly originating in Asia, Europe and some in North Africa. The latter include *Rosa canina*, *Rosa corymbifera* and *Rosa sempervirens* which are from Morocco, Algeria, and Tunisia. *R. richardii* and *R. moschata* var. *abyssinica* originated at the Red Sea region. (Gerd Krüssmann, Roses). Interesting is that South Africa has over the years officially naturalized only two roses: *Rosa rubiginosa* (Sweet briar, Eglantine rose) and *Rosa x odorata* (Tea rose). These are some of the species of roses cultivated in South Africa: *Rosa abyssinica*, native to tropical East Africa; *Rosa acicularis* (Arctic rose, Prickly rose); *Rosa agrestis*; *Rosa banksiae* (Lady Banks' rose); *Rosa bracteata* (Macartney rose); *Rosa caesia*; *Rosa canina* (Dog rose); *Rosa chinensis* (China rose, Fairy rose); *Rosa foetida* (Austrian briar, Austrian yellow rose); *Rosa rugosa* (Japanese rose, Rugosa rose); *Rosa serafinii* (Mediterranean rose); *Rosa setigera* (Prairie rose); *Rosa sinowilsonii*; *Rosa spinosissima* (Burnet rose, Scots rose); *Rosa sweginzowii*; *Rosa wichuraiana*; *Rosa x borboniana* (Bourbon rose); *Rosa x centifolia* (Cabbage rose, Holland rose, Provence rose); Hybrid bred from *Rosa gallica*, *Rosa moschata*, *Rosa canina* and *Rosa damascena*. *Rosa x damascena* (Damask rose); Hybrid of *Rosa gallica* and *Rosa moschata*. *Rosa x harisonii*.

Uses of rose

Roses for the use in daily life were produced for the decorations at festivals, of both rooms and guests, for important ceremonial presentations, for needs of personal cleanliness, for the decoration of tombs and finally, for the religious sacrifices and funerals. When speaking of the use of roses it is the flower that

stands in the forefront. One should never forget that the rose plant also fulfils its duty to our earth. The mere capacity of photosynthesis and respiration surely beats that of a succulent, as they are designed differently. Therefore, the rose plays an equally important part in cleansing urban air, cooling the atmosphere around us and assisting with use and recycling of vital essential elements in the soils; providing nutrition to bacteria, fungi and micro-organisms living in the soils. Yet the rose takes up much less water than our beautiful, invasive, inter alia Jacaranda trees.

As rose gardeners we can adapt to scare water conditions by gardening wisely; ensuring that water will reach the roots of the plants and a good layer of mulch is used to combat the hot, sunny months. Or as said earlier, we can under plant roses with other smaller indigenous annuals and small perennials. It would make no sense to decide in a wild act of preserving the natural diversity in South Africa to go into the garden and rip out all plants that are exotic, as some have already formed micro-habitats for other living creatures. Roses as such will never pose the problem of becoming invasive as their seed need to lie cold, wet and dormant for a good 2 -3 months before even attempting germination.

Benefits of rose

The preservation of the rose lies in its strong power to alleviate human sorrow and uplift our physiological well being which is closely linked to our health. The wide biodiversity in roses viz shape, size, type, colours and divine fragrances help us combat stress, sooth the pain of love madness, help us forget for moments all the bad and scary things this world presents us with on a daily basis. Thus, we humans will (hopefully) consciously and subconsciously protect the roses and conserve its huge biodiversity. The scent of roses in particular awaken our senses: we associate relaxing, calmness, delicacy, harmony, heart opening, love and sensuality with it.



Classification of rose

Classification of roses is still very complicated issue because of its wide and complicated biodiversity. From where rose did come? And how they evolved? is a matter of interest. Answer is not easy. There are several views about roses, and specially species roses. Rose can be reproducing by seeds and vegetative propagation but seed formation is uncommon in all types of roses. In one feature all roses can be classified in a group that is shrub. All roses are categorized under this common head. Seedling of roses look alike the mother plant but genetically they are different. Roses that were found growing wild in nature especially in forests are mostly species is one school of thought but it may not be always true. In nature and in wood, due to insect pollination and dissemination of seeds by bird it is a common phenomenon by which along with species hybrid seedling may also grow side by side and the fact that rose which are growing wild are rose species is not true at all. Crossing and recrossing of the species either by natural way or through human efforts, led to the evolution of the major group of the garden roses which created wide biodiversity in rose. Species roses are the ancestors of the garden roses. One hundred and fifty years of hybridization has given us perfect budding roses with breath taking new colour and vigorous growth.

Rose cultivars of the garden and their status

The roses cultivated in the gardens for ornamental purpose are complex hybrids of several wild species and their number runs into several thousands. Rose breeders are creating new and novel types continuously and in this way creating huge biodiversity.

Classification of rose

Many botanist and rose growers have tried their best to classify the roses in a systematic way. They have their own versions and style of classification. Due to different climatic zones and genetic

complexity it is difficult to classify roses. Many workers have tried to classify roses on the basis of different characters viz shape and size of all parts of rose which includes prickles, hairs on the calyx, foliage edges, etc. The two plants of the same species have variation in foliage number, pattern and size. If we see the old history of Europe we will find that there was one old known rose species in Europe i.e. *Rosa gallica*. Damask rose comes afterwards and then followed by all of the roses. Credit goes to Linnaeus (1764) who had one of the oldest classification systems which includes *Rosa piminellifolia*, *R.gallica*, *R.canina*, *R.rubiginosa* and *R.alba*. At that time he stated that it was difficult to classify roses. Boitard (1838) classified roses into three classes i.e. *R. lutea* (yellow or foetida roses), *R.simplicifolia* or *R.berberifolia*, and *R.mutabilis*. DeCandolle classify roses into eight classes viz. *Systylae*, *Rubigineae*, *Gallicanae*, *Cinnamona* (it included *R.alpina* and *R.rubifolia*), *Pimpinellifoliae*, *Villosae*, *Caninae* and *Eglanteriae*. Thory (1820) listed 25 groups of roses, which included *Collinae*, *Montanae*, *Cynorrhodenses* (*R.canina*), *Gladulosae* (*R.rubiginosa*), and *Spinulifolias*. In Botanical classification roses belongs to the order Rosales, family Rosaceae and genus *Rosa*. A genus includes one or more species. Species is a wild population of plants that reproduce true to the type from the seed. Wild roses are often called species rose. Classification of rose suggested by various workers and their respective divisions, class, sections and groups are given in Table-1.

American Taxonomist Rehder reported that there are about 120 or more species of roses. A large majority of which are native to the arctic region. They are found growing wild in the northern hemisphere from the Arctic to as far as South as North Africa, the Yemen, Thailand and New Mexico. Thomas (1962) classified the group of cultivated roses into two categories i.e. Wild rose and their hybrids and old shrub roses.

Wild roses and their hybrids

The wild roses and their hybrids includes



Table-1 :Classification of rose by different workers along with their respective classes, section and group with wide biodiversity

Name	No. of Division/ Class/Section	Names of Division/Class/Section and Groups
Lindley	Seven Divisions	Cinnamomae, Pimpinellifoliae, Centifoliae, Villosae, Rubiginosae, Caninae and Systylae.
Trattinnick	Six Divisions	Joquiniana, Smithiana, Raurana, Candolleana, Woodsiana and Lindleyana.
Dumortier	Four Sections	Systylae, Chinesis, Cinnamoneae and Caninae.
Reichenbach	Seven Classes	Setigerae, Aculeosae, Villosae, Rubiginosae, Caninae, Centifoliae, Nitidae.
Kock	Four Sections	Caninae, Cinnamomae, Pimpinellifoliae, Centifoliae, Rosae and <i>Rosa nobiles</i>
Hegetschewellers	Six Sections	Alpinae, Arvensis, Caninae, Cinnamomae, Spinosissimae and <i>Rosa nobiles</i>
Godet	Two Classes	Diastylae (5groups): Lepatacanthae (alpina, rubella, pimpinellifolia), Dimorphacanthuae (cinnamonea, gallica). and Systylae
Desglise	Nine Groups	Systylae, Gallicanae, Pimpinellifoliae, Alpinae, Caninae, Eglanteriae, Rubiginosae, Cinnamomae, and Tomentesae.
Crepin	Twelve Classes with numerous subsets	Synstylae (9 species, sempervirens, arvensis), Stylosae (7species, stylosa), Gallicanae (10species, gallicas), Alpinae (7species, alpines), Sabiniae (7species, sabini, coronata), Pimpinellifoliae (11species, spinosissimas), Montanae (14species, Montana, rublifolia), Caninae (117 species, Lutetianae, Transitoriae, Biserratae, Hispidae, Pubesecantes, Collinae, Tomentillae, and Sabratae), Glandulosa (16species, jundzilli), Rubiginose (35 species, Sepiaceae, Micranthae, Suavifoliae), tomentosae (26species), and Villosae(14species, Pomifera), 273 species in all.
Gandoger	Twelve Groups	Renamed all the groups. He did name one of the groups, Hulthemia which is used even today
Keller	Two Groups	Exerti (Synstylae, Stylosae), and Inerti (Cinnamomae, Alpinae, Pimpinellifoliae, Luteae, Sabiniae, Villosae, Orinetales, Montanae, Gallicanae, Caninae, Rubiginosae, and Tomentesae.
Christs (similar to Crepin)	Nine Groups	Tomentellae and Grandulosae being placed under Rubiginosae. Listed 316 species



Garden rose (cultivars), Banksians, Hybrid wichuraianas, Climbing polyanthas, Boursaults, Ayrshires, Noisettes and Teas, Climbing HTC.

Old shrub roses

Old shrub Roses include Albas, Sweet briers, Scotch roses, Gallicas, Mosses, centifolias, Damasks, Poly-pones and fairy roses, Portlands, Bourbons and Hybrid perpetuals, Hybrid teas, Hybrid Polyanthas, Floribundas, Hybrid Musks, Hybrid rugosas.

Sub genera of roses

Roses are divided into four subgenera of which three are small and aberrant and the fourth, Eurosa, contains the roses proper. The important ancestral species from which modern roses have been bred are all to be found in four of the ten sections of Eurosa (Anonymous, 1972). Gardeners and nurserymen have grown up with the traditional classification of rose and termed such as Hybrid Tea, Floribunda, Miniature, Climbers and Ramblers, Shrub roses and it has become common practice. The Rose world has felt for many years that a better and more precise system is needed, and in 1971 the World Federation of Rose Society accepted in principle the British proposals (Hessayon, 1981). The new classification arrived and in 1979 the RNRS began to use it in their show schedules. The unfamiliar terms beginning to appear in catalogues and magazines.

New classification of rose

The new classification explained by Hessayon (1981) is quite simple and easy to follow. The new classification of rose includes three groups i.e. Modern Garden Roses (Roses which are neither old Garden Roses nor wild roses. They are categorized into two heads i.e. 1. Non-climbing Modern Garden Roses; 2. Climbing Modern Garden Rose Old Garden roses (Includes two categories viz. 1. Non-climbing old Garden Roses; 2. Climbing Modern Garden Rose and Wild Roses (This group is categorized in two heads i.e. 1. Non-climbing wild rose

2. Climbing wild rose).

Mutations and hybridization in rose and its biodiversity

Biodiversity in roses has been created by natural hybridizations and spontaneous mutation. Bud sport and induced mutations have played a very important role in origin and evolution of many ornamental crops and rose is not an exception. Many of the present day garden cultivar of ornamental plants owes their origin to mutations and hobby oriented growers and nursery men maintained these new cultivars in their collection in nursery and gardens.

Mutations (or genetic deviation) can produce changes in morphology, different growth habits, leaf shape/sizes, flower colour, petal shape, size number and arrangements, inflorescence, etc., or changes in physiology- change in general vigor, hardiness to cold or drought, frequency of bloom cycles, etc. Most mutation and changes understandably go undetected, but two changes are quite obvious and are interesting to watch for. These two are changes in flower colour and change from bush to climbing form. A reasonably large number of mutant Minis presently appear in the commercial market (William Osburn, 1994.).

Non-climbing modern garden rose

A non-climbing Modern Garden rose includes non-recurrent shrub, recurrent shrub, recurrent bush (Large flowered bush-Hybrid Tea, clustered flower bush-Floribunda, and Polyantha), and recurrent miniature). Modern Garden Rose includes Non recurrent Rambler, Non recurrent climbers, Non recurrent miniature, Recurrent Rambler, Recurrent climbers and Recurrent Climbing Miniature.

Non climbing old garden rose

The non-climbing old garden rose includes Alba, Bourbon, Damask, Gallica, Hybrid Perpetual, Moss, Portland, Provence (Centifolia) Sweet Briar Tea.



Fig. 1 : Wild Rose species with very primitive characters

Explanation of rose species given in fig.1

Rosa hirtula : *Rosa hirtula*, a spreading bush with simple flowers and thorny stems. It is a native to Japan. It is very similar to *Rosa roxburghii*.

Rosa banksiae var. **normalis 'Lutea'** : Yellow double-flowered Banksia Rose (*Rosa banksiae* var. **normalis 'Lutea'**) is a once-flowering, spring-blooming cultivar of a vigorous climbing rose and it is found in western and central China.

Rosa ussuriensis : *Rosa ussuriensis* is a rarely cultivated *Siberian shrub* with small, rather sparse flowers

Rosa chinensis 'Viridiflora' : *Rosa chinensis 'Viridiflora'* (syn 'Monstrosa') is a mutant form of the China rose 'Old Blush' dating from 1843, in which the petals are scale-like.

Rosa foetida 'Bicolor' : *Rosa foetida* 'Bicolor' is an orange cultivar of a normally yellow flowered Middle

Eastern and western Asian species. Known since around the 12th century, it has importance in the history of rose hybridization.

Rosa glauca : *Rosa glauca* (syn. *Rosa rubrifolia*) is a very hardy shrub. It is a native to the mountains of central and southern Europe. It is known for its blue-green foliage.

Rosa woodsii : Western Wild Rose (*Rosa woodsii*) , a rather stiffly branched shrub rose native to western and central North America.

Rosa xanthina : *Rosa xanthina* 'Canary Bird' (*R. xanthina* forma *spontanea* × *R. xanthina* forma *hugonis*), an inter-form hybrid of *Rosa xanthina*, a spreading 3m tall species from China and Korea, with larger flowers than the species.



Fig. 2 : Biodiversity in difference cultivars of shrub roses

Shrub Roses : Shrub roses are a specialized branch of rose growing which when fully established provides a delightful display in the gardens. Shrub roses are excellent for hedging purposes or can be used as specimen plants. In most of the varieties flowers are freely produced. Plants are vigorous and well branched which makes them bushy, and do not require great deal of pruning. Some of the important cultivars of the shrub rose grown in the gardens are 'John Cabot', 'Carefree Delight', 'Rosa 'Macy's Pride', 'Bonica', Sunny Knock out', 'Pink Abundance and 'Hybrid rugosa'. Flowers are large or small, borne in twos or threes or in big clusters, more or less continuous flowering. There are old shrub roses and the varieties derived from the species. Like *R.alba*, *Rosa bourboniana*, *R. centifolia*, *R. centifolia muscosa*, *R.damascena*, *R.gallica* etc. Modern shrub roses are the results of crosses between *R.moschata* and various modern roses commonly know as Hybrid Musk. Wide range of biodiversity in flower colour, shape and size of shrub roses have been reported (Fig.2).

Climbing old garden rose

Climbing old garden rose includes Ayrshire, Boursault, climbing Tea, Noisette and Sempervirens.

Non-climbing wild rose

Non-climbing wild rose includes all species of group shrub roses *R.rubrifolia* and Canary Bird. Climbing wild rose includes a few ramblers roses for

example *Rosa filipes* Kiftsgate. Steve Jones (2001) is of the opinion that the modern roses of today are near impossible to classify with the influx of characteristics from all the past it is hard to lump them together.

Biodiversity of *Rosa chinensis mutabilis* (China rose)

China rose is a roof top plant having broad



spectrum of biodiversity and has many ethno botanical benefits. It is widely used in preparation of traditional Chinese medicines for centuries. It provides flower for most of the year and provide wonderful protective habitat for birds.

Antique rose varieties with C-3 photosynthesis with hardiness

Most of the roses are considered C-3 photosynthesis type plant and need some protection from the wind to prevent desiccations. These antique varieties are extremely hardy and the green roof top plant here has rambed across ten meters of roof. The antique rose varieties though not as showy as recent hybrid are much more suited for a green roof with their resistance to disease, drought and their importance to wild life.

Biodiversity with huge seed producing multiflora rose

Multiflora rose is a thorny perennial shrub. It reproduces by seed and by forming new plants from the tips arching canes that contact the ground. Birds are the primary dispensers of its seed and an average plant may produce a million seeds per year with seed remaining viable for 20 years. The plant is extremely aggressive and can form in penetrable thickets that exclude native vegetation.

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Conclusion

Roses have wide biodiversity in growth habit (Hybrid -Tea, Polyalthia, floribunda, grandiflora, climber, rambler and miniature), spiny habit of the stem to spine less roses (City of Lucknow) flower size (1-20cm approximately), petal number (4-100), colour range (Broad range of colour spectrum even blue and green i.e. *R.chinensis Viridiflora*), single, bi-colour and more than two colors, combinations of colour in specks and stripe forms, different shapes (flat to almost spherical), different sizes and class with their own flowering habit (mini, floribunda, hybrid tea, polyanthus and grand flora and fragrant to non fragrant roses, disease resistant cultivars are few of the example which highlighted the biodiversity of rose. Hybridization (Natural crosses and plant breeders efforts), Mutation breeding (Bud sports and induced mutations), Polyploidy, somaclonal variation and bio-technology has played an important role in creation of huge biodiversity in roses which are preserved in Botanic gardens, nurserymen's collection and various Research Institute all over the world. Owing to their diversified growth habit, exquisite shape, variation in size and form, attractive colours, delightful fragrance and innumerable varieties; roses have gained wide acceptability all over the world. Pass port data of rose germplasm existing in various Institutions of India under different agro climatic conditions has also been documented by Bhattacharjee *et.al.*, (2002).

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