

## **Cayratia** sps. of family Vitaceae for utilization in grape improvement programme

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### **ABSTRACT**

Exploitation of new and diverse sources of variation is needed to combat various biotic and abiotic stresses. In the collection of wild grape germplasm, different species of *Cayratia* (Family *Vitaceae*) were studied after collecting them from various sources of Indian forests. These species were identified taxonomically, evaluated them for morphological characters, cytological relationship, fungal diseases, insect & pest infestation, phyto-chemicals and medicinal uses and other important traits. *Cayratia* sps. have ephemeral growing habit. They grow in dry deciduous to moist evergreen forests. Some of the species of *Cayratia* are rare and endemic to N.E. India and Andaman. The chromosome numbers are varying ranging from  $2n = 22$  to 120, showing polyploidy. These species are resistant to major fungal diseases as well as tolerant to insect pests. Phyto-chemicals recorded which have importance in preparations of Ayurvedic medicines, homemade remedies, natural pesticides and classification of plants. Information generated through study has significant importance in conservation of plant biodiversity and utilization of wild resources of cultivated grapes in grape improvement programme with the help of advanced tools of biotechnology.

**Key words:** Biodiversity, *Cayratia*, medicinal uses, pest resistance, phytochemicals

### **INTRODUCTION**

Grape is commercially important fruit crop of India. The narrow genetic base of cultivars coupled with low utilization of genetic resources is the major limiting factors in increasing production and productivity of any crop. Exploitation of new and diverse sources of variation is needed for the genetic enhancement. *Cayratia* Juss. belongs to family *Vitaceae* having about 55 species, distributed mainly in tropical and sub-tropical regions of the world with the maximum number of species reported from Malaysia. About 10-12 species are reported in Indian Floras by various taxonomists (Gamble, 1935; Kanjilal *et al.*, 1936; Shetty and Singh 2000). It has better tolerance to biotic and abiotic stresses (Patil *et al.*, 1990, 2001) and good source of phytochemicals (Patil and Honrao, 2000). It has been used in Ayurvedic and homemade preparations (Asolkar *et al.* 1992). Some of the species of *Cayratia* are edible (Putz, 1991). Main objective here is to study different species of *Cayratia* occurring in India to assess the potential utilization to introgress new traits in cultivated grapes.

### **MATERIALS AND METHODS**

As a part of All India Co-ordinated Research Project (Fruits) of ICAR, New Delhi cultivated and wild grape germplasm have been maintained in field and nursery at Agharkar Research Institute, Pune. The tuberous roots and seedlings were collected from various sources of

Western Ghats, Eastern Ghats, Sub-Himalayan regions, Central and North-East India as well as Andaman forest area and planted in nursery followed by transplantation in field to observe the performance. The species were identified taxonomically and maintained separately. Chromosome numbers were detected as per the method suggested by Sharma and Sharma (1980). *In-situ* observations for morphological characters, insect pests and diseases were recorded at the time of collection. *In-vitro* tests were carried out in laboratories and pest infestation was studied in nursery. Detection of phytochemicals was carried out from the fresh plant material of stems and leaves by method suggested by Harborne (1973) and Gibbs (1974). Information regarding medicinal uses was reviewed from literature and folk medicine used by tribal.

### **RESULTS AND DISCUSSION**

Demand for increasing yield of fruit crops with the threat of new pests and diseases as well as climate change are significant. Abiotic and biotic constraints in grape production result in limitations in production and productivity in grapes. Novel ways for genetic improvement using untapped genetic diversity available in crop wild relatives and closely related species must be explored. Considering above, following aspects of *Cayratia* sps., were studied during the course of investigation.

## COLLECTION AND CONSERVATION

The family *Vitaceae* comprises of 14 genera and about 900 species distributed worldwide (Wen *et al.*, 2007). It is economically important family and consists of several wild edible species (Shetty and Singh, 2000). The classification of genera belongs to family *Vitaceae* is based on characters like hermaphrodite or polygamous flowers, number of petals simple/trifoliate or pedately 5-7 foliate leaves. In India, family *Vitaceae* is represented by 8 genera and 63 species. Remarkable morphological diversity has been recorded in family *Vitaceae*. Planchon (1887) resurrected three genera viz. *Vitis*, *Ampelopsis* and *Cissus* into six. Within *Cissus*, Planchon (1887) recognized again three subdivisions as the genera *Cissus*, *Cyphostemma* and *Cayratia* (Gagnepain, 1911). The distinguishing characters described are mainly seed morphology and the nature of endosperm. Generally, *Cissus* is characterized by simple leaves and one seeded fruit whereas, *Cyphostemma* by compound leaves and one-seeded fruits while *Cayratia* by compound leaves and multiple seeded fruits.

During the course of investigation, nine *Cayratia* species were collected from different parts of India are presented in table 1 and photo images in Figure 1. *Cyphostemma auriculatum* and *Cissus elongata* which were classified earlier as *Cayratia auriculata* and *Cayratia elongata* by Roxburgh are also included in current study.

## EVALUATION OF GERMPLASM

Before utilization of any collection in breeding programme, it is prerequisite to generate cytological information to study relationships among cultivated and wild types. In advance and modern techniques of biotechnology, basic information like chromosome numbers is essential. Without such information crop improvement programme would not be possible. Information regarding cytological studies in *Cayratia* sps. is very much scanty (Fedorov, 1969). Lot of variation in chromosome numbers was observed in members of family *Vitaceae*. In most of the cultivars of grapes, haploid chromosome number is reported to be  $n = 19$  and diploid  $2n = 38$ . The chromosome numbers in *Cayratia* vary from  $n = 11$  to  $n = 60$ . *Cayratia carnosa* have chromosome number  $n = 60$  and  $2n = 120$ . In *Cayratia pedata*, it was  $n = 40$  and  $2n = 80$

(Vatsala 1960, Patil *et al.*, 1980). The chromosome numbers in *Cayratia auriculata* was reported as  $n = 11, 12$  and  $2n = 22, 24$  whereas it was reported in *Cayratia elongata* as  $2n = 24$  (Patil *et al.*, 1980). Chromosome number  $n=30$  was reported in *Cayratia anemonifolia* by Karkamkar *et al.* (2010).

## Brief morphological description of genus *Cayratia* with its species under study

Genus *Cayratia* belongs to family *Vitaceae* which is characterized by 3-foliate or pedate or digitate leaves, 2-4 seeded berries, hemispheric seeds having deep pits.

**Habit:** Most of the species of *Cayratia* have tuberous roots and climbing shrubs with tendrils opposite to the leaves. These are perennial plants that emerge quickly in the spring and die back after a short growth and reproduction phase keeping underground parts dormant.

**Leaves:** alternate, trifoliate or pedate, stipules 2, small.

**Flowers:** hermaphrodite, tetramerous, in auxiliary or pseudo-terminal corymbs or umbels.

**Calyx:** cupular, not or rarely toothed. **Petals:** 4, valvate, sometimes corniculate, more or less cucullate within. **Stamens:** 4, inserted round the disc. **Anthers:** introrse. **Disc:** entire, sinuate, or lobed, adnate with the ovary. **Ovary:** 2 celled, with 2 ovules in each cell. **Style:** subulate. **Stigma:** indistinct.

**Fruit:** 2-4 seeded, berry and usually dry.

**Seed:** obovate to oblong, smooth or angular, hemi-spherical, pyriform or oblong, convex on the back, with 1 or 2 ventral cavities covered with a membrane.

### 1. *Cayratia anemonifolia* (Zipp. ex Miq.)

Suess. (= *Vitis anemonifolia* Zipp. ex Miq.)

**Habit:** scandent herbs.

**Stem and branches:** slender fistular obscurely angular, pubescent, grayish green.

**Leaves:** leaflets terminal, 5.30 - 6.30 x 3.5 cm. and other leaflets 2.50 - 4 x 1.5 - 3 cm. 5-7 pedate, ovate sub rotund, lower leaflets somewhat oblique, shortly acuminate, coarsely serrate with recurved apex, lateral nerves 5-7 spreading parallelly, outwardly base obtuse.

**Petioles:** 5-6 cm. long, puberulous, petiole 1-1.5 cm long pubescent, stipules persistent, scarious in older branches.

**Tendrils:** leaf-opposed, forked puberulous.

**Inflorescences:** 5-6 cm long, axillary, dichasial cyme, lax flowered, pubescent.

**Flowers:** 3-3.5 mm long, pedicels 4-5 mm. long flashy, pubescent, calyx 1.5 mm. across. Saucer shaped, margins very short, thin puberulous. **Petals:** 4, 2.5 mm, long, ovate-lanceolate, acute, not hooded. Stamens; 4, 1.5 mm long, opposite, filaments flats, broader, near base, anthers oblong – obtuse. **Disc:** 1 mm long, entire, concave, **Ovary:** thin 2 locular, style 0.5 mm. Simple thin, glabrous stigma simple.

**Flowering & fruiting:** July- November.

**Distribution:** India (Tamil Nadu) and Indonesia.

## 2. *Cayratia carnososa* (Wall) Planch (= *Cayratia trifolia* (L.) Domin)

**Habit:** herbaceous climber with succulent compressed stems arising from a stout perennial rootstock.

**Stem:** thin, attaining 2.5 cm. diameter with corky bark. Branches brittle, young striate pubescent or villous.

**Leaves:** 3- foliolate leaves and crenate or dentate leaflets usually 5-7 cm., long pubescent both sides. Usually curly crenate with a fine point from the sinus but sometimes coarsely serrate irregularly dentate the latter from somewhat hispid on the nerve only terminal, elliptic or obovate, lateral usually broad ovate and somewhat cordate at the base, leaflets ovate / obovate, rounded, serrate or dentate.

**Tendrils:** slender wiry, branched. Inflorescence: cymes thinly hairy long peduncled, 5-10 cm. diam.

**Flowers:** small with green ovate petals, rarely white.

**Fruit:** berries, black depressed globose, 1-2 cm. diam. 2-4 seeded.

**Seed:** triangular, round out the back and with a linear tubercle wedge shaped on the face.

**Flowering & fruiting:** throughout the year.

**Distribution:** India (almost throughout country); Australia, Bangladesh, China, Malaysia, Myanmar, Nepal and Pakistan.

## 3. *Cayratia japonica* (Thunb.) Gagnep. (= *Vitis erioclada* Wt & Arn.)

**Habit:** whole plant quite glabrous, a very slender climber.

**Stem:** slender, herbaceous, petioles 2-4 in leaflets shortly stalked, 3-8x 2-5 cm.

**Leaves:** membranous, pedately 5 foliolate, glabrous or pubescent, leaflets sharply serrate, lanceolate or ovate lanceolate, acute sharply serrate, Tendrils: short, simple or forked.

**Peduncles:** long, cyme some bearing branches appearing terminal.

**Flowers:** in divaricating dichotomous cyme, bisexual, style short, stigma large, sub peltate.

**Fruit:** turbinate globose, the size pea, 1-4 seeded.

**Seeds:** 5 x 4 mm, triangular, pyriform, rounded and muricate on the back sharply ridged on the face, seeds acute at base, much rugose, above chalaza on back round.

**Flowering & fruiting:** March - June.

**Distribution:** India (Arunachal Pradesh, Assam, Karnataka, Kerala, Goa Manipur, Mizoram, Nagaland, Tamil Nadu, and Andaman & Nicobar Islands); Australia, Bangladesh, Bhutan, Cambodia, Japan, Korea, Malaysia, Myanmar, Nepal, Taiwan and Vietnam.

## 4. *Cayratia mollissima* (Planch.) Gagnep. (= *Vitis latifolia* Roxb.)

**Habit:** slender climber.

**Stem:** glabrous, slender when young covered with long hispid hairs.

**Leaves:** 5-8 in covered with long soft dense hairs, membranous, hairy on both surface. 3-foliolate, long and softly villous. Petiole 5-7 cm long, Ovate or oblong-ovate, acute or sub acuminate, faintly serrate, lateral very oblique. Tendrils very slender, forked.

**Flowers:** about 1.25 cm. long, peduncle, divaricating cymes equaling the petiole. Style: long slender.

**Fruits:** dry, fleshy, white, nearly 1 in diam., 2-3 seeded.

**Seed:** 9 x 5 cm. elliptic oblong boat shaped, rounded and polished on the back and with a linear tubercle hallow on the face.

**Flowering & fruiting:** March – September. Flowers in rainy season, remains dormant after winter and summer season.

**Distribution:** India (Arunachal Pradesh, Western Ghats of Karnataka, Kerala & Tamil Nadu); Cambodia, Malaysia, Myanmar, Thailand and Vietnam. The species is mostly found in deciduous forest during the monsoon season.

## 5. *Cayratia pedata* (Lam.) Gagnep. (= *Cissus pedata* Lam.; *Columella pedata* Lour; *Vitis pedata* (Lam) Wall. ; *Vitis canarensis* Dalz.)

**Habit:** large weak climber shrubs with cylindrical often hirsute branches and soft

pubescent leaves, whole plant softly pubescent or glabrous.

**Leaves:** membranous, pedately 7-9 foliolate usually softly pubescent, leaflets oblong lanceolate, acuminate. **Petiole:** 7-13 cm. long leaflets on long stalk with terminal leaflets 10-17 x 4-8 cm. oblong lanceolate acuminate serrate, often at length nearly glabrous, cymes as long as or longer than petiole.

**Inflorescence:** cyme sub corymbose with widely divaricating branches. **Tendrils:** forked, **Flowers:** bisexual, green covered with a grayish pubescence.

**Fruit:** sub globose somewhat flattened at the apex, small sized fruit 4 seeded. Peduncle: 2.5-3.5 cm. in long, fruit white.

**Seed:** 3 mm. diam. Hemispherical hollowed out on the flat side and the opening closed by a thin membranous. The seed resembles exactly that of *Cayratia roxburghii* but is rather smaller.

It is a woody climber occurring in the Himalayas and Khasi hills.

**Flowering & fruiting:** June – November.

**Distribution:** India (Andhra Pradesh, Arunachal Pradesh, Assam, Bihar, Karnataka, Kerala, Meghalaya, Orissa, Tamil Nadu, West Bengal and Andaman & Nicobar Islands); Bangladesh, Cambodia, Indonesia (Java), Philippines Myanmar, Sri Lanka, Thailand and Vietnam.

*Cayria pedata* var. *glabra* is distributed in evergreen forests at an altitude of about 1800 m. in Tamil Nadu and it is endemic to India.

**6. *Cayratia roxburghii* (Planch.) Gagnep.** (= *Vitis roxburghii* Wight & Arn., *V. roxburghii* M.A. Lawson)

**Habit:** glabrous climbing shrubs with smooth black shining bark.

**Stem:** slender bark smooth.

**Leaves:** trifoliolate, leaflets large glabrous entire or undulate dentate, 5-8 in glossy glabrous very membranous. **Petioles:** 5 cm., leaflets 3-7 in stalks 2-2.5 cm. elliptic lanceolate, acute or sub acuminate, entire.

**Tendrils:** simple long slender cyme shortly pedunculate, 7-10 cm. branching, divaricating, fruiting peduncles 5 cm. long.

**Inflorescence:** cymes longer than the petioles.

**Flowers:** small green style conspicuous.

**Fruit:** the size of a currant, dry 2-4 seeded.

**Seeds:** hemispheric hollow cup shaped the opening closed by a membrane. Seed hemispheric section on seed albumens more or less crescent shaped section of albumens with

nearly circular outline, not grooved within face cavity deep. The seed closely resembling that of *V. pedata*, but a little large and darker coloured.

**Distribution:** India (Kerala and Tamil Nadu) and Sri Lanka

**7. *Cayratia tenuifolia* (Wight & Arn.) Gagnep.** (= *Vitis tomentosa* Heyne.)

**Habit:** very slender glabrous vine.

**Stem:** slender, herbaceous, petiole 5-10 cm., leaflets shortly stalked 2.2-7.5 x 2-5 cm., lanceolate, or ovate, lanceolate, acute, sharply serrate.

**Leaves:** membranous, pedately 5 foliolate glabrous leaflets small sharply serrate.

**Tendrils:** short, slender., simple or forked.

**Peduncles:** long, Inflorescence: cyme somewhat diffuse, axillary but often owing to the sudden suppression of the flower bearing branches appearing terminal.

**Flowers:** tetra merous, peduncles and pedicels filiform, in divaricating dichotomous cymes bisexual, style short, stigma capitate.

**Fruit:** black, turbinate, globose, the size of a pea 1-4 seeded, 3.8 - 4 mm., triangular, rounded and muricate on the back, sharply ridged on the face.

**Distribution:** India (Karnataka, Kerala & Tamil Nadu); China and Sri Lanka.

**8. *Cissus elongata* Roxb. (= *Cayratia elongata* (Roxb.) Suess.)**

**Habit:** very large glabrous climber.

**Stem:** stem compressed, succulent, polished and smooth branching.

**Leaves:** digitately 5 (less commonly 3) foliolate. Leaflets elliptic, lanceolate, shortly acuminate, serrate membranous narrowed into a stalk.

**Tendrils:** long, simple, leaf opposed.

**Inflorescence:** leaf opposed, cymes di-tri chotomous.

**Flowers:** Tetramerous, greenish purple, Calyx cup shaped. **Petals** - 4, oblong, style short, Stigma simple, Disk 4 lobed, Ovary ovoid.

**Fruit:** berry, ellipsoid, elliptic, smooth and black when ripe.

**Seed:** One long, ellipsoid, pointed at one end rugose on back and large elliptic pit on front.

**Flowering & fruiting:** May – December.

**Distribution:** India (Western Ghats of Maharashtra, Goa and Karnataka); Bangladesh and Bhutan.

**Table 1: Collection and conservation of *Cayratia* species**

Sr. No.	Name of the species	Chromosome number	Collection area	Places of collection
1	<i>Cayratia anemonifolia</i>	n= 30	Western Ghats	Pune, Anamali Hills, Nilgiri Hills, Goa.
2	<i>Cayratia carnosa</i>	n= 80	South India	Anamali Hills, Nilgiri Hills.
3	<i>Cayratia japonica</i>	n= 30	South India	Anamali Hills, Nilgiri Hills, S. Canara.
4	<i>Cayratia mollissima</i>	2n= 40	South India	Anamali Hills, Nilgiri Hills, S. Canara.
5	<i>Cayratia pedata</i>	2n= 40	South India	Anamali Hills, Nilgiri Hills, S. Canara.
6	<i>Cayratia roxburghii</i>	-	South India	Anamali Hills, Nilgiri Hills, S. Canara.
7	<i>Cayratia tenuifolia</i>	2n= 30	South India	Anamali Hills, Nilgiri Hills, S. Canara.
8	<i>Cissus elongata</i> Roxb. (= <i>Cayratia elongata</i> )	2n= 24	Western Ghats	Konkan, S. Canara, Pune, Dang Forest.
9	<i>Cyphostemma auriculatum</i> (= <i>Cayratia auriculata</i> )	2n= 24	Western Ghats	South Canara, Tinnevely, Konkan, Goa.
- : Data not available				

**Table 2 Disease and Pest observations of *Cayratia* species**

Sr. No.	Name of the species	Leaf caterpillar	Chaffer beetle	Flea beetle	Downy mildew	Powdery mildew	Anthraxnose
1	<i>Cayratia anemonifolia</i>	R	R	R	R	R	R
2	<i>Cayratia carnosa</i>	R	T	T	R	R	R
3	<i>Cayratia japonica</i>	-	-	-	R	R	R
4	<i>Cayratia pedata</i>	R	R	R	R	R	R
5	<i>Cissus elongata</i> (= <i>Cayratia elongata</i> )	R		T	R	MR	R
6	<i>Cyphostemma auriculatum</i> (= <i>Cayratia auriculata</i> )	R	R	R	R	R	R
R= Resistant, T= Tolerant, - = No observation							

**Table 3: Inferences of the phyto-chemical tests in *Cayratia***

Phyto-chemical tests										
Sr. No.	Name of species	1	2	3	4	5	6	7	8	9
1	<i>Cayratia anemonifolia</i>	+	-	-	+	-	-	+++	+	+
2	<i>Cayratia carnosa</i>	+	+++	+	+++	-	+++	+++	+++	+
3	<i>Cissus elongata</i> (= <i>Cayratia elongata</i> )	+	-	-	+	-	+	+++	+	+
4	<i>Cayratia pedata</i>	-	-	+	+++	-	+	+	+	+
5	<i>Cyphostemma auriculatum</i> (= <i>Cayratia auriculata</i> )	+++	-	-?	+	+++	+++	+++	+++	-
1. Hot-water Test, 2. Leuco-anthocyanin Test, 3. Syringin Test A, 4. Maule Test, 5. Saponin Test A, 6. Tannin Test, 7. Raphide Test, 8. Mucilage Test, 9. Flavonoid Test.										
2. Reactions: + = Very weak, ++ = Weak, +++ = Strong, ++++ = Very strong, - = Negative										

**9. *Cyphostemma auriculatum*** (Roxb.) P.Singh & B.V.Shetty (= *Cissus auriculata* Roxb.; *Vitis auriculata* (Rob.) Wallich ex M.A.Lawson; *Cayratia auriculata* (Roxb.) Gamble)

**Habit:** large climber.  
**Bark:** older stems spongy and deeply cracked.  
**Branches:** cylindrical, succulent, the young parts softly pubescent.

**Leaves:** 5-foliolate, petioles 7-15 cm long. leaflets on long stalk by 2.5-10 cm. , obovate, acute or shortly acuminate, serrate, membranous, mostly 5- foliolate, digitate, softly pubescent beneath, when young, at length glabrous.

**Stipules:** large, falcate, ear shaped. Tendrils: 2-3 cleft.

**Inflorescences:** umbellate in divaricating sub corymbose. Peduncles and pedicel flashy.

**Flowers:** Small and tetramerous. Cymes long thick weak, succulent peduncles, divaricating, longer than the petiole.

**Fruit:** Cherry sized, round, globose, red, one seeded.

**Seeds:** Elliptical, rounded at the base. Seed structure more like that of *Cissus*.

**Distribution:** India (Andhra Pradesh, Bihar, Goa, Gujarat, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Orissa, Rajasthan, Tamil Nadu and West Bengal); Bangladesh and Myanmar.

#### DISEASE AND PEST RESISTANCE STUDIES

Detailed observations were recorded for disease resistance for downy mildew, powdery mildews, anthracnose, rust etc. at the time of collection in nursery and field under natural epiphytotic conditions. It was confirmed *in-vitro* under laboratory condition. Pooled data suggest that all these species under study appeared to be resistant to downy mildew and powdery mildew which is major biotic stress in grape production today (Honrao *et al.*, 1993). According to Patil *et al.* (1990), these species could be utilized as source for downy mildews, powdery mildews and anthracnose resistance in grape breeding programme.

The evaluation of insect pest, flea beetle, chaffer beetles, cater pillars and nematodes infestation was made and resistant species were recorded at ARI, Pune by Patil, *et al.*, (2001). Observations were recorded regarding the pest infestation as per methods used by Patil *et al.*, (2001). Data was pooled and is presented in Table 2. Growers are spending huge amount of money on various pesticides to control the pests and spraying hazardous synthetic chemicals which, results in pesticide residue. Tolerant species have great significance in Viticulture and can be used in grape improvement programme.

The phyto chemicals in plants derived as large number of secondary metabolic compounds, provide protection against insect attacks and plant diseases. They have special significance in evolutionary traits. Inferences of the phytochemical tests in *Cayratia* are presented in Table 3. Lignins are present in *Cay. carnososa* and *Cay. pedata*. Raphides are present in *Cay. anemonifolia*, *Cay. carnososa*, *Cissus elongata* and *Cyphostemma auriculatum*. Mucilages are present in *Cay. carnososa* and *Cyphostemma auriculatum*. Flavonoids are present in all species with weaker reactions except *Cyphostemma auriculatum*. Singh *et al.*, (1986) reported the presence of flavonoids in *Cay. auriculata* and *Cay. pedata*. Leucoanthocyanins are present in *Cay. carnososa* with stronger positive reactions. Tannins are present with stronger reactions in *Cyphostemma auriculatum* and *Cay. carnososa*. Bachmann and Blaich (1979) have reported that the stronger reactions to tannins showed more resistance to fungal infections. According to Gopalen *et al.* (1980) tannins in plants acts as an effective repellent to animals and microbial predators or parasites protecting the plants from birds, insects and pathogenic organisms.

#### WILD EDIBLE SPECIES OF CAYRATIA

Three species of *Cayratia* have been reported as wild edible plants (Putz 1991). Leaves of *Cayratia carnososa* are used as vegetables and berries are also consumed by Bodo tribals in Sikkim Himalaya (Sundriyal *et al.* 1998). Young leaves of *Cayratia japonica* are consumed in Malaysia (Ong *et al.*, 2011). The young shoot and leaves of *Cyphostemma auriculatum* are eaten as vegetables.

#### MEDICINAL USES

Leaves of *Cay. pedata* have astringent, refrigerant and diuretic properties. It also yields deep green waxy oil and sterol. The seeds of *Cyphostemma auriculatum* are used as remedy for ulcers and diarrheas. Decoction of leaves used to check uterine disorder and fever. Leaves of *Cay. carnososa* ground with black pepper applied as poultices to ulcer and boils. Juice of the tender leaves used in dental trouble and ulcers. Decoction of roots is taken in chronic dysentery. Berries of *Cay. mollissima* are used as poultices to swelling and itching. Seeds and roots of *Cay. carnososa* are useful for the treatment of yoke sores of Bullocks. Crushed stem and tubers rubbed against swelling and

body pains. Fruits of *Cay. carnososa* are eaten by birds, roots and bark is used for swelling, chest pains, spleen complaint, dysentery and bone fracture. Hollow stems contain some quantities of potable water. The species have medicinal properties and economic value (Asolkar *et al.*, 1992). Tuberous roots used in swelling of leg and chest, spleen complaints, dropsy, pimples, tubercular, fistula, sore and dysentery, neuralgia, pleurisy, pneumonia, ringer pest and bone fracture. Roots and bark is used for hemorrhoids (Anonymous, 1994).

In view of above discussion, *Cayratia* has great significance in plant improvement programme by introgressing useful traits in cultivated grape varieties using modern techniques of biotechnology.

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Figure 1. *Cayratia anemonifolia* habit , 2. *Cay. anemonifolia* flower, 3. *Cay. pedata* habit 4. *Cay. carnosia* habit, 5. *Cay. carnosia* fruit, 6. *Cay. carnosia* seed, 7. *Cissus elongata* habit, 8. *C. elongata* fruit, 9. *Cissus elongata* seeds, 10. *Cyphostemma auriculatum* habit, 11. *Cypho. auriculatum* fruit, *Cypho. auriculatum* seed